THE IRON TRADE REVIEW

VOLUME XXIII. CLEVELAND, O., DECEMBER 18, 1890. NUMBER 51.

THE IRON TRADE REVIEW.

A JOURNAL OF THE
IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS
IS PUBLISHED EVERY THURSDAY BY THE
CLEVELAND PRINTING AND PUBLISHING CO.,
Corner St. Clair and Wood Streets, Cleveland, O.

TERMS, (strictly in advance):

One year	$3 00
Six months	1 50
Three months	75

Advertising Rates Furnished on Application.

ENTERED AT THE POSTOFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

CLEVELAND, O., DECEMBER 18 1890.

THE WEEK IN IRON CIRCLES.

General Features.

The year is closing with an unusually tight squeeze in the money market. Everybody says it will not last long, and everybody's saying so will hasten the resumption of confidence, the lack of which is the sole cause of the present stringency. The volume of business continues heavy, and the new year will doubtless bring the much needed turn for the better. Of course, the continued stringency is affecting the buying of iron, and purchases are being made sparingly by the smaller consumers, they buying only what iron they have immediate use for. There is, however, a constant demand being made that iron already purchased be forwarded promptly, consumers, in many instances, having valuable contracts that they do not wish to lose, and are therefore urging the furnaces to keep up shipments, so that the fault cannot lie in lack of pig iron. This there is great trouble in doing, owing to scarcity of cars and the strike South. If the strike continues, Southern iron may advance slightly for a short time, but at the present time the strike has had no effect, save to cause consumers to urge the prompt shipment of iron already bought. At last accounts six or eight furnaces in the Birmingham district had blown out, and others will soon follow suit. There has been some buying of Southern irons for delivery next year, but this on the part of large consumers, who are making purchases because iron is now cheap and it is the time to buy. About 13,000 tons have been bought by one party in the Louisville market during the week, at $12.75 for half each No. 3 foundry and grey forge, or one-third each close silver grey, grey forge and No. 3 foundry, deliveries beginning in March and running through the year. The Cincinnati market continues dull and heavy. Consumption keeps up better than would naturally be expected under the circumstances existing. Most of the foundries and mills are well employed. Some of them have followed the hand-to-mouth policy so closely as to run entirely out of iron and be forced to stop temporarily for supply. Our Detroit correspondents take a more hopeful view of the situation. They write that, while the dullness reported last week has continued in a measure as far as actual transactions are concerned, there certainly is a much better outlook, judging from the number of inquiries which have been made, and which, naturally, will result in a considerable tonnage being placed within the present week, or at least, it can safely be said, before the first of the year. The inquiry is almost exclusively for coke irons, and is prompted by the better outlook in the money market, added to the fact of some permanent business being definitely arranged for as far as the middle of 1891. The fact of the inquiries having been made, added to the banking of so many furnaces in the South, will make iron a decidedly scarce article, and, our correspondents think, will cause a much firmer market, and if the financial condition improves, unquestionably will cause higher figures to be realized. At Chicago a fair number of small orders is being placed and prices remain unchanged, except in a few instances, where holders of iron are compelled to close out, in order to realize funds. The fact is noted at Buffalo, that consumers, if they desire, can now purchase from a large number of furnaces at a figure which will not exceed cost of production, and from some few furnaces at less than cost, but even under these circumstances no considerable amount of buying is being done. In viewing, however, the general demoralization in trade throughout the country, it is universally conceded that pig iron occupies a strong position. The low range of prices insures a fair degree of stability. Consumers generally, in the section about St. Louis, have iron enough to run them into the new year, and they are waiting to see the result of the financial flurry before placing further orders. There is about the usual lessening of consumption in architectural works incident to the season, but other foundries are fairly well supplied with orders.

The Local Situation.

The past week has not been productive of anything new in any of the lines of trade affecting the iron ore or pig iron markets, and, as a matter of fact, nothing new is expected to transpire for some weeks to come. Nobody is at all active, most of the firms being engaged in the preparations for taking stock, and the close proximity of the holidays acts as a check upon any intended activity that may exist. The situation is one that calls for the united action of the ore interests together with the furnacemen. The entire business for the next year calls for a defensive and offensive alliance of this character, and this is getting to be better understood from day to day. There is little doubt of the fact that much of the present trouble is directly traceable to the mistaken policy of a year ago, of booming the price of pig iron all out of proportion, and at a time when the market was feverishly excited, and easily influenced. Wiser counsel deprecated the movement at that time, but the price went sailing along until Bessemer iron sold at $25. It was this sort of business that brought Southern iron into this market, and now that the manufacturers of lake iron are confronted with the keenest sort of competition, in a market where a difference of ten cents a ton is felt, the opinion is freely advanced that it will take years of work, and of moderate profits, to secure for lake iron the place to which it is naturally entitled. As it is, Southern iron has, to a very large extent, driven all other from the local field, while a considerable amount of iron made in the Mahoning and Shenango valleys is consumed in the East, competing against tide water and imported irons, in the face of freight rates that must be disastrous to the manufacturer. It is claimed on all hands that if the business is to be carried on at all next year, ore profits must be kept down to a modest figure, lake and rail freights must be correspondingly low, the present price of coke must be cut in two, and pig iron must be sold on a narrow profit margin. Even at that, it will take a long time to regain the disputed ground. It is true that the Southern furnaces are losing money, and that their losses will increase in proportion as the price of Southern labor will advance along with freights, but it may take a long time to bring the Southern brethren to a realizing sense of their position, and, in the meantime, things are anything but lovely. As for the coke situation, the opinion is advanced that it might not be unprofitable to start up additional coke plants along the line of railways other than those now carrying coke, and the Erie road may be selected for that purpose, in opposition to the Pennsylvania Co., with a view to stimulate the entire business. A large coke plant, controlled and operated by the furnace interests most directly concerned, would not be a bad adjunct to the opposition, and would have a tendency to make the coke barons less lordly in their dealings. In a local way, no business is doing worth the speaking of. The only observation that is pretty generally made, is that the average cost of making pig iron is $2 a ton higher than it was a year ago, while prices are about the same.

Merchant Iron.

The demand is still good for bar iron, which commands $1.75 at the mill. The price of sheets has not been changed for weeks, and the business is fairly good. Shapes of all kinds are in good demand at the full combination price, $3.20. Gas pipe is very scarce, and is difficult to obtain.

STRICTLY BUSINESS.

Where *The Iron Trade Review* is made, how it is made and who make it are topics in which the reading public probably take very little interest; but once in a while it is permitted by the ethics of trade to sound one's own praises, and this seems to be the time and the opportunity. When, in the Fall of 1882, *The Iron Trade Review* came into the possession of the firm of Day & Carter, it had a small plant and a doubtful prestige. Eight years of persistent effort have wrought many changes and produced great results. With the paper as a nucleus—itself since enlarged and improved and its business systematized and increased—there has been built up around it, during the last three years, a general printing business which, on account of its phenomenal growth, has attracted general attention. Since 1887 the ownership of the paper and the control of the general business have been in the hands of The Cleveland Printing and Publishing Company, a corporation whose stockholders embrace the senior member of the late firm, a number of tried and practical associates, and a few of the best known citizens of Cleveland. The company has, during the period of its corporate existence, occupied what at first appeared to be ample quarters in the extensive "Lithograph Building," at the corner of St. Clair and Wood streets; but so rapid has been the extension of its plant that more space has been in pressing demand for upwards of a year past. Accordingly, a long lease has been taken of the large power building on Vincent street, (Nos. 27, 29 and 31), known as the "Vincent Building," and lately occupied by the Dangler Stove and Manufacturing Company, possession to be taken on or before January 1st, 1891. This building consists of five floors, each 47x100, is centrally located and well lighted, and is being fitted up with all of the appointments of a first-class modern printing establishment. In the basement is located the power, besides which will be ample space for storage purposes. On the main floor will be the offices of the company, finished in hard wood and conveniently arranged. In the rear is a large packing and shipping room. The second floor will be given up to the presses, which embrace a number of the most modern and powerful book and job machines made. Folding machines and cutters will complete the complement of this department. On the third floor will be the book, job and news composition room of the establishment, and on the fourth floor, the bindery. New departments are to be added as rapidly as practicable, and no pains or expense is being spared to make this a model printing establishment in every particular. Our friends will be welcome at any time after the first of January to visit and inspect our new home.

AN OVERWHELMING VERDICT AGAINST IRON WARRANTS.

From the first, *The Iron Trade Review* has been persistently against the scheme of introducing the element of systematic speculation into the iron trade by the adoption of the Scotch pig iron warrant system in this country. We have never doubted that the solid sober sense of the iron manufacturers of the United States was very largely on our side of the question, but since some of the Wall street and Southern defenders of the scheme have seen fit to misrepresent the true situation, we determined to put the matter to the practical test of a poll of the iron works of the country. Accordingly, a letter of inquiry was addressed to all the blast furnaces, rolling mills and steel works in the United States, with the result which appears elsewhere in this issue. Replies were received from 92 concerns in 18 out of 26 States in which pig iron is manufactured. From Pennsylvania came 33 replies; from Ohio, 15; New Jersey, 7; Michigan, Alabama, and Virginia, 5 each; Illinois, 4; Missouri, Maryland, Connecticut, Delaware and Indiana, 2 each, and Wisconsin, Minnesota, Massachusetts and New York, one each, with one scattering.

The result is scarcely encouraging to the advocates of pig iron gambling. Fifty-six iron manufacturers declare unequivocally against the scheme, and only ten in favor of it. Twenty-six are non-committal. Of the ten in favor of the system, six are blast furnaces, and four rolling mills. Of the 56 against it, 37 are blast furnaces and 19 rolling mills and steel works. Of those who do not express a positive opinion, six are blast furnaces and 20 rolling mills and steel works.

That the opposition to the scheme is not local or sectional is evident from the fact that it comes from 14 States, South as well as North, as follows; Pennsylvania, 20; Ohio, 16; Michigan, 5; New Jersey, 4; Missouri, Delaware, Virginia, and scattering 2 each, and Wisconsin, Illinois, Indiana, Massachusetts, Maryland and Minnesota, one each.

Of those who favor the system, two are from Pennsylvania, two from Alabama, two from Virginia, one from Ohio, and three scattering.

The pig iron warrant system has been on trial in the United States for about two years, we believe, and in England for many years. The verdict abroad, as shown by the widespread agitation against it, is too strong to be ignored, and from the foregoing summary, it would appear that sentiment on this side of the water was even more emphatic and overwhelming.

The above facts would be referred to the *Tradesman*, of Chattanooga, were it not that, in its current issues it ingloriously retires from further discussion of the subject. As this is its answer to our proposition to print in this paper all the evidence it could offer in favor of the system, in return for an equal space in its columns for such argument against it as we might produce from leading iron masters at home and abroad, and even from its own editorial columns, its position is not altogether enviable. However, if it is content to let the matter rest in its present shape, we certainly are.

NEVER SUCH A YEAR FOR IRON ORE.

In accordance with its annual custom, *The Iron Trade Review* has collected statistics of the receipts of iron ore at Lake Erie ports for the season of 1890, together with the total amount of iron ore on dock December 1st, when navigation was virtually closed. According to these figures, there were on dock at these ports at the opening of navigation, May 1st, 1890, 936,228 gross tons of ore. The total receipts for the season of 1890 (closing December 1) were 6,874,664 tons, making a total of 7,810,892 tons. Of this, there were shipped to furnaces by rail from Lake Erie ports during the season of 1890, 3,917,405 tons, leaving on dock, December 1st, 3,893,487 tons, as against 2,607,106 tons on dock at the close of navigation last year. This shows an increase of ore on dock this year of 1,286,381 tons over last year at the same time. The detailed figures as to receipts for the past eight years are given in the subjoined table:

TOTAL RECEIPTS AT LOWER LAKE PORTS FOR EIGHT YEARS.

Port.	1883.	1884.	1885.	1885.	1887.	1888.	1889.	1890.
Toledo	27,617	2,444	15,000	26,960	61,729	75,601	82,961	164,295
Sandusky	58,825	106,540	143,150	157,970	160,600	154,924	186,682	174,596
Huron	.....	.....	.....	44,02	21,288	4,351	680	1,200
Lorain	25,794	30,156	13 180	99,744	134,763	197,000	280,000	280,450
Cleveland	723,129	904,850	589,234	1,034,650	1,216,423	97 ,775	1,742,415	1,945,492
Fairport	40,334	23,100	31 932	112,000	501,368	511,140	829,121	1,096,408
Ashtabula	670,000	650,000	582,000	672,000	1,103,839	1,288,530	1,963,490	2,176,730
Erie	106,787	116,027	122,223	91,250	20,48[illegible]	249,338	373,595	487,493
Buffalo	40,203	8,750	7,160	31,869	28,659	240,000	298,000	548,000
Total	1,692,689	1,841,877	1,503,959	2,270,551	3,439,198	3,783,659	5,856,344	6,874,664

The following table shows in detail the ore stocks on hand at the close of navigation in the years respectively stated;

IRON ORE ON DOCK AT CLOSE OF NAVIGATION.

Port.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.
Toledo	25,000	18,000	12,000	15,000	50,000	53,255	85,340	110,740
Sandusky	44,083	72,834	87,457	80,000	65,000	100,000	175,000	115,000
Huron	.....	.....	.....	8,500	11,700	9,200	39	1,200
Lorain	25,611	25,107	34 346	69,304	110,000	100,000	170,000	2 0,237
Cleveland	428,654	482,238	494,683	464,691	487,327	527,626	518,816	1,209,467
Fairport	15,000	2,100	7,500	7,000	223,318	250,000	390,000	721,000
Ashtabula	291,878	349,306	331,110	285,697	522,516	686,833	1,071,011	1,151,317
Erie	95,369	77,750	81,844	36,000	89,003	95,092	128,900	248,714
Buffalo	17,500	None	None	None	None	26,500	68,000	125,732
Total	943,095	1,038,135	1,048,940	966,472	1,558,861	1,848,555	2,607,106	3,893,487

Of the 3,893,487 tons of ore on dock December 1st, 1890, practically not a pound remained unsold. The unsold ore on dock at the close of navigation last year was estimated at 70,000 tons. Adding this to the receipts of 1890 (6,874,664 tons) we have 6,944,664 tons as the aggregate amount of ore sold for delivery at Lake Erie ports during the present season, as against 5,411,412 tons sold for such delivery in 1889. The corresponding sales for 1888 were 4,366,359 tons.

The total lake shipments from Lake Superior for 1890 were 8,145,850 tons, of which 6,874,664 tons were sent to Lake Erie ports, leaving 1,271,186 tons as the amount shipped to Chicago and other Northwestern points, as against 1,288,588 tons in 1889.

The proportion of sold and unsold ore at Lake Erie ports on the dates named has been as follows:

Date.	Sold.	Unsold.	Per cent. Unsold.
December 1, 1884	388,115	650,020	62.6
December 1, 1885	918,940	130,000	12.4
December 1, 1886	896,472	70,000	7.2
December 1, 1887	858,861	750,000	48.1
December 1, 1888	1,681,255	167,300	9.
December 1, 889	2,537,106	70,000	2.6
December 1, 1890	3,893,487	None.	.....

The increase in receipts at Lake Erie ports this year over last has been 17½ per cent., and over 1888, 80 per cent. The increase in the amount on dock this year over 1889 is 50 per cent., and over 1888, 110 per cent. The presence of nearly 3,900,000 tons of ore on dock awaiting shipment to furnaces tells the story of the present condition of the pig iron market more eloquently than words.

Concerning the relative standing of the different ports as ore receivers, comment must be reserved for a future issue, attention in

the meantime being directed to the continued growth of Ashtabula, Fairport and Buffalo as receiving ports, their advance in the last three years being truly remarkable.

DOCK FACILITIES OF LAKE SUPERIOR PORTS.

Highly important information, much of it for the first time published, is to be found in the article elsewhere on the iron ore and coal handling facilities of Lake Superior ports. The figures cover the leading ports, but necessarily are not entirely complete, Gladstone, L'Anse and St. Ignace being omitted from the ore figures and the same ports, together with Marquette and Escanaba, from the coal data. A summary of the data contained in the article shows the following as to the iron ore dockage at the ports named;

	Frontage devoted to loading. Feet.	Average width. Feet.	Storage capacity. Tons.	Daily handling capacity. Tons.	Number of ore pockets.	Average height of docks. Feet.	Greatest height. Feet.
Two Harbors	3,550	47	34,000	10,000	303	50	50
Ashland	8,588	43	78,000	25,000	702	43·7	46
Marquette	9,788	40.75	73,485	21,100	774	41·75	47
Escanaba	7,800	38	97,790	30,020	826	44	48
Total	29,276		263,275	86,100	2,605		

A like summary of the coal dockage is as follows:

	Frontage. Feet.	Average width. Feet.	Storage capacity. Tons.	Daily handling capacity. Tons.	Square feet of docks.	Number derricks.
Two Harbors	425	125	50,000	800	53,125	3
Duluth & West Superior	12,290	314.2	1,595,000	34,400	3,957,500	111
Ashland	1,310	275	125,000	2,400	360,250	9
Total	14,025	714.2	2,270,000	37,600	4,370,875	123

Footed up, the above figures show a total frontage of 43,751 feet, or between eight and nine miles. With an average width for the coal docks of 275 feet, and for the ore docks of 40 feet, the total amount of space occupied by these docks is 5,559,915 square feet. The total storage capacity is 2,533,275 tons, and the total daily handling capacity is 123,700 tons.

Similar statistics for Lake Erie ports, collected last Summer by *The Iron Trade Review*, showed a total frontage of ore docks of 45,549 feet, with a total square feet area of 10,148,150, a daily handling capacity of 90,970 tons, and a storage capacity of 6,485,000 tons.

SIXTY YEARS IN THE IRON BUSINESS.

Not often do we have the privilege of congratulating a veteran iron manufacturer upon the completion of sixty years of consecutive, active service in the business, and especially is this a pleasure when the acquaintance is of a personal and intimate character. In October last, Mr. Joseph Corns, of the firm of Joseph Corns & Sons, proprietors of the Massillon Rolling Mill, Massillon, O., rounded up three score years of experience in the iron business, and, what is better, he is still actively employed, with very few evidences of impairment by reason of age. We are not aware that there is another living mill manager who has been so long in service and is still actively engaged.

Born in Tredegar, Monmouthshire, South Wales, November 9, 1821, he came with his parents to the United States in the Spring of 1830, landing in the city of Baltimore, Maryland. In the Fall of the same year, his father found his first situation in this country as a heater in the Pennocks' mill, located in Chester Co., Pa., and designed for rolling boiler plate. Early in October, of 1830, the elder Corns commenced work, taking his son Joseph to work with him at the furnace, the duties involving the intricate operation of pulling up the door. Boys were hired in those days for that work, their wages being 25 cents per day. Joseph continued at that work until 1832, when he found his way into a nail factory at Phœnixville. In 1833, he went to Bridgton, N. J., at which place he made his first attempt to work at the nailplate rolls. In the Spring of 1836, he came back to the town of Manyunk, near the city of Philadelphia, Pa., being employed at the small mill as a catcher; wages, 62½ cents, or, as it was known in those days, five levies a day, and no grumbling. If the boys should so far forget themselves as to do so in the hearing of the roller, a box on the ear or a kick was likely to follow. While a catcher at the small mill, it was his privilege to catch one turn's work of $\frac{5}{16}$ round iron that was made by hand. Guide rollers will understand what that means; guide mills were scarce those days in this country.

Late in the Fall of 1836, he went to Reading, Pa., and commenced work at roll-turning at the iron works at that place. In the Spring of 1837, he went, by canal boat, to Pittsburgh, crossing the Allegheny mountains in the same canal boat—the boat, family, furniture and all going together and being dumped into the canal again at Johnstown, Pa. On arriving in Pittsburgh, he went at once to work at roll-turning in the Pipetown Rolling Mill, now known as Henry Lloyd, Sons & Company's. In the Winter of 1838-9, not liking the business of roll-turning, he found a situation as a catcher at the muck rolls, for Messrs. Lorenz & Cuddy, now the property of the Painter Sons. During 1840, he undertook to learn the trade of a shingler, and in 1844 made his first engagement, to take the place of a master workman with the Wagner Iron Works, Pittsburgh. Remaining with that firm until the Fall of 1847, he removed to Buffalo, N. Y., and there, in connection with others, built the Buffalo Iron and Nail Works. Here he was engaged till the Spring of 1869, when he removed to Akron, O., being employed to manage the Akron Iron Company's works. In August, 1878, he fitted up the Girard Iron Company's works, Girard, O. He remained there until 1880, when, with his son, James C. Corns, he leased, for three years, the works of the Massillon Iron and Coal Company, located in the city of Massillon, Stark County, O., and on the expiration of the lease, purchased the plant and is still operating it.

OUR GREAT HIVES OF INDUSTRY.

Every large city is a magnet, drawing steadily upon the brain and brawn of the surrounding territory. Cities appear to go by groups. While each city has an integral existence, it has interests in common with some larger city, which tie the two together in indissoluble bonds. Each thrives along with the other. Let us take, for illustration, seven of the large cities tributary to the Great Lakes. The census figures on this point are very instructive and we group them herewith;

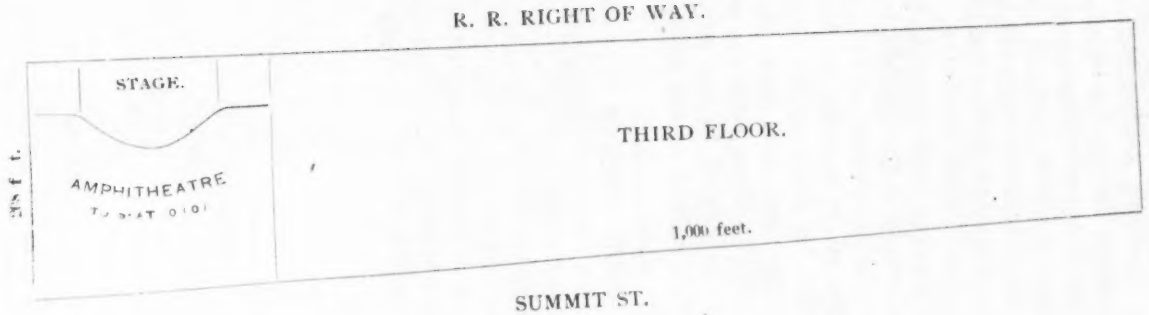
	1870.	1880.	1890.
CLEVELAND	92,829	160,140	261,546
Akron	10,006	16,512	27,702
Canton	8,660	12,258	26,327
Toledo	31,584	50,137	82,652
Youngstown	10,011	18,113	21,117
BUFFALO	117,714	155,134	251,457
Rochester	62,386	89,366	138,327
Syracuse	43,051	51,792	87,877
Utica	28,804	33,914	44,001
PITTSBURGH	86,07	156,3896	238,473
Allegheny	53,180	78,682	104,967
Erie	19,646	27,737	39,099
McKeesport	2,523	8,212	20,711
CHICAGO	298,977	503,185	1,099,133
Joliet	7,263	11,657	27,407
Peoria	22,849	29,259	40,758
Rockford	12,049	13,129	25,589
DETROIT	79,577	116,340	205,669
Bay City	7,064	20,693	27,826
Grand Rapids	16,507	32,016	64,147
Jackson	11,447	16,105	20,779
Saginaw	7,460	10,525	46,215
MILWAUKEE	71,440	115,587	204,150
Oshkosh	12,663	15,748	22,752
Racine	9,880	16,031	21,022
MINNEAPOLIS	13,066	46,887	164,738
St. Paul	20,030	41,473	133,156
Duluth	.....	2,645	32,725

We doubt if any group or groups of cities on the continent, or in the world, show a more rapid and substantial advance than the above. All the elements of natural advantages, climate and enterprise combine to make them what they are and what they promise to be by the end of the present decade.

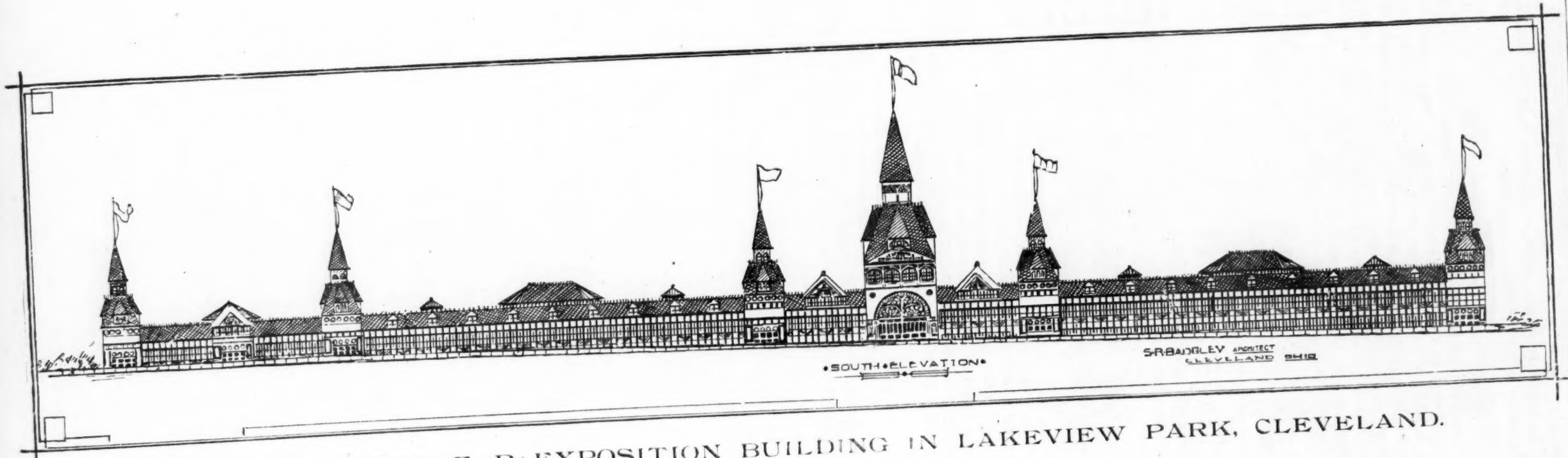
BASIC STEEL ROYALTIES.

The article elsewhere from the pen of Mr. Jacob Reese, patentee of the basic steel process, is very timely, in view of the announcement, this week, that the Steel Patents Company has finally fixed the royalty to be charged parties employing that process. The royalty, as fixed, is $1 per ton, and it will be interesting to observe the comments of Southern parties who have been awaiting with much anxiety the decision of the basic steel people on this important question. We hazard the guess that the announcement will be received with ill-concealed chagrin, not to say indignation, since it is not at all likely that any one will want to go into the business on this basis. The North and West are not particularly interested in the basic process, having an abundant supply of Bessemer ores, and the opinion we herewith express, that the syndicate has overreached itself in its anxiety to realize on its investment, will possess at least the merit of disinterestedness. No one will object to the owners reimbursing themselves for their outlay, or even for exacting a small royalty, but to impose a tribute that virtually excludes third parties from participation in the benefits of this important invention is unpatriotic, unwise and unbusiness-like. Ever since 1881, the owners have done their utmost to shut off the adoption of this process, neither using it themselves nor allowing others to do so. Compelled at last to show their hand, they disclose a selfishness that cannot but react upon them and defeat the very object intended to be reached.

PERSPECTIVE, AS SEEN FROM LAKE.



GROUND PLAN.



PLAN PROPOSED FOR EXPOSITION BUILDING IN LAKEVIEW PARK, CLEVELAND.

cargoes. The total aggregate frontage is 2,400 feet, with a 1,925-foot front devoted to the loading of vessels. Within this frontage, there are on the north side of the dock 88 pockets, and 74 on the opposite front, giving a total of 162 pockets, having a total capacity of 16,000 tons. The water adjoining is from 17 to 21 feet in depth, and the dock itself is about 47 feet wide by about 50 feet high.

The No. 2 dock has a total length of 1,200 feet, and a total water front of 1,925 feet, of which 1,625 feet is devoted to pocket room, the north side having 600 feet front and 53 pockets, while the south front has 1,025 feet provided with 88 pockets. The gross frontage for this side is 1,200 feet, and for the north side 725 feet, making a total of 1,925 feet. The dock has 141 pockets, of 1,800 tons total capacity. This being the more recent dock, it is provided with larger pockets. It was constructed in 1885.

Additions have been made to the docks each season, until they now reach the above figures:

The slip between the docks is 1,200 feet by 125 feet wide, having water from 17 to over 21 feet deep.

The total frontage devoted to the loading of vessels reaches 3,550 feet, with a total of 303 pockets, having an aggregate tonnage capacity of 34,000 tons and a daily handling capacity of 10,000 tons.

It is proposed to erect a third dock, south of the No. 1 structure, at some future time, placing the new one, or the No. 3 dock, some 200 feet away. It is to be constructed of iron and steel, and will increase the frontage devoted to the ore business some 2,100 feet, and the tonnage all of 20,000 tons, or probably 25,000 tons, which would then show for Two Harbors a frontage of 5,650 feet, and a tonnage capacity of 59,000 tons.

The present breakwater is 550 feet long and 1,275 feet from the end of dock No. 1 and 1,270 feet from the end of the proposed or No. 3 dock.

There is also shown on the map a projected breakwater in line with the present one, from the opposite side of Agate Bay, which is to be 1,025 feet long, leaving an entrance between them of 1,725 feet, which, with the 550 feet of the present one and the distance of 120 feet that it is away from shore, makes a total of 3,420 feet, the width of the bay at this point. The bay, when the proposed breakwater is completed, will include all of one square mile of area. The end of the proposed structure is 1,325 feet from the dock No. 1.

Two general merchandise docks are maintained, one of 404 feet length and a second of 379 feet long, having between them a slip of 400 feet long by 100 feet wide—the docks themselves being 50 feet wide. The west dock has a frontage of 735 feet and the east one, used as a coal dock since 1888, has a frontage of 475 feet, upon which there are employed three rotary hoists, in conjunction with hoppers overhead, which admit of loading direct to railroad cars or of conveying to the large storage space of 125 feet by 425 feet. They can handle 800 tons of coal per day of ten hours with the three rotary hoists. The Duluth & Iron Range Railroad affords rail connections to the mines and to Duluth.

The coal receipts for 1888 were 25,000 tons; in 1889, 30,000 tons, and to September 15, 1890, 34,000 tons, or a total of 89,000 tons since 1888. The probable receipts for 1890 will reach 36,000 tons. The iron ore shipments have been as follows, viz.: 1884, 62,122 tons; 1885, 227,075 tons; 1886, 307,948 tons; 1887, 394,910 tons; 1888, 452,110 tons, and in 1889, 826,813 tons, while the probable shipments for 1890 will reach 900,000 tons. The elegant fleet of vessels of the Minnesota Steamship Co. have made a flattering record in carrying ore from this port, as will be seen from the following figures: The steamer Manola carried out 18 loads—41,127 tons; Mariska, 16 loads—36,163 tons; Maruba, 8 loads—19,264 tons; Matoa, 4 loads—9,792 tons; total of 106,346 tons up to September 1, 1890.

This fleet will be increased by the addition of two new boats next season, and no doubt will be able to carry 350,000 tons to the lower lake ports. Mr. James Pickands, of Cleveland, is the Vice-President of the company, and to him, with Mr. J. Greatsinger, General Superintendent of the Duluth & Iron Range Railroad, we are much indebted for courtesies and valuable assistance in the compilation of this article.

Two Harbors is at present without a lighthouse, but the ground therefor has already been selected, and, without a doubt, next season will find a lighthouse at this port.

DULUTH AND WEST SUPERIOR.

Duluth, the city of the Northwest which gained its first wide-spread reputation through the famous Congressional speech of Proctor Knott, has since then had a most eventful career. Ushered into the roll of Western towns along in the fifties, its youth was of the placid order and not unlike the early existence of many another frontier town. The very foundations for the imaginations of its founders to build upon as to situations of future greatness were lavishly laid by nature. The geographical location of this thriving, soon-to-be Western metropolis, are remarkable in the combination of short distances by rail to the country tributary thereto with maritime advantages, which place it in the forefront of commercial factors, both now and respecting subsequent developments.

Its harbor is unexcelled, both in ease of access and in its extent of anchorage and dock frontage. Minnesota Point forms a natural breakwater that at once becomes the envy of less favored ports which have to depend upon artificial protection. A ship canal leads through the point, near its joining to the mainland, and close to the center of Duluth. The possible dockage frontage which could be placed at the disposal of the vessel interests exceeds that of any other port of the lake system of interior waterways.

The great Northwest is directly tributary to it, hence it becomes a point of distribution to all the vast stretches of country between it and the Pacific. The radiating bands of steel extend in all directions and afford highways of communication commensurate with the great expectations centered upon this port. Here they meet and converge and are lost under the buoyancy of the waterways, which bring to her doors the trade of the nations, in fleets such as no other merchant marine can outdo.

Man's adaptability to working out existing problems of nature becomes, as it were, only another element in the continued race of development, being of a higher order, making subservient to his intelligence the resources of inanimate *terra firma*. He now brings by human means the bowels of the earth from one locality to another to aid and co-operate in subjecting a refractory element, so as to bring about new orders of usefulness and vary the adaptability thereof.

Duluth and its near neighbor, West Superior, have many interests in common; in fact, a prophecy of a distinguished writer, not long since uttered, embodied the thought that at no distant future a city of metropolitan size would be a realized condition, and that most likely a common municipality would direct the affairs of such an amalgamation; and, further, such city, from the very nature of things, should be located at the head of the lakes.

The derivation of the designation Duluth, undoubtedly, is from the name of an assistant to Father Hennepin, in 1682, who was known as Daniel Greylson Du Lhut, which name was easily modernized as Du-Luth. His deed of valor acquiring for him distinguished mention was the rescuing of Father Hennepin, as a prisoner, from the Sioux Indians, during their return from a passage down the St. Croix river.

Superior, of course, has taken upon itself the beautiful name of the largest body of fresh water known. This name was undoubtedly derived from the elevation of this body of water above Lake Huron, hence a natural inference of superiority. This was most likely the reason for ascribing to it so proper a name, since the early travelers upon its shores and waters could not, at that distant time, have as clear a conception of the relative size of these inland lakes to each other.

Our statistical data and any enlargements thereon will embody in sum totals the two as one.

Referring to the bird's-eye view, we notice the spaciousness of the harbor, as inclosed by Minnesota Point, as well as the additional area furnished by the Bay of St. Louis, and it is impossible to fail in seeing the immense dockage area that can be utilized between Minnesota Point and Rice's Point. Rice's Point, upon its eastern front, is well built up, but its western side is yet open to the establishment of docks for any increase of future business. The shore line of St. Louis Bay, upon the Minnesota side, is mostly open to improvement in the way of docks, etc., and, indeed, the other side of this bay, on the Wisconsin shore, can furnish an additional area for maritime business. A considerable portion of this space is already utilized on either side of the railroad bridge connecting Duluth and West Superior.

Here there is the shore line of Connor's Point, on either side, which is available, as well as the front of Superior upon the Bay of Superior. Last, but not least, is the large front of Minnesota Point, facing on the bays of Duluth and Superior.

A railway and street tunnel, constructed under the ship canal, would open the point to inter-communication with all the railroads entering Duluth or Superior. This plan would, of course, necessitate extensive dredging, but no more than is urgently needed for the perfecting of the harbor and dockage facilities to such an extent as to place the facilities of this port second to none in the world.

The available frontage in the district described must reach upwards of 25¼ miles. This distance may be approximated by giving to Duluth from the ship canal, including Rice's Point, to Grassy Point, 9½ miles, and, adding the six miles of Minnesota Point, would make 15½ miles. Superior, from Grassy Point to the end of Minnesota Point, inclusive of Connor's Point, has about 9¾ miles, showing a total of over 25 miles available for dockage purposes. Of this frontage, Duluth has already availed herself of five miles of her harbor front, while Superior has docks

in use along three miles of her water front, making a total of eight miles, leaving over 17 miles for occupation. What pair of cities can show an equal?

Pertinent to the harbor and dockage facilities is the appended quotation of Harbor-Master Miller, of Duluth, from the Cleveland *Leader*, of October 16: "About November 1 there will be a channel fit for loaded vessels between Duluth and Superior harbors, along the east side of Rice's Point. We already have three dredges at work, and at least one more will be started there. While the channel will be deep enough, it will be narrow, and it would be well for vessels to use it as little as possible this year. Next Spring, before boats arrive from below, it will have been widened by dredges and will have been scoured by the currents. Do you realize that the entire harbor, the whole bay, is being gradually deepened by scourings? It is a fact, and tugs can now run in perfect safety where a few years ago there was only three or four feet of water. The time will come when the entire bay will be deep enough for an anchorage."

An idea may be gained from the following general data of the recent heavy business transactions: In 1887, 374,659 barrels of flour were shipped, and two years hence, the flour shipments were 469,100 barrels. The total elevator capacity is over 20,000,000 bushels.

The coal receipts per year since 1878 are appended:

Year.	Tons.	Year.	Tons.
1878	31,000	1886	736,000
1881	163 000	1887	1,100,000
1882	260,000	1888	1,535,000
1883	420.000	1889	1,045,000
1885	595,000	1890 (probably)	1,500,000

The numbers on the bird's-eye view are representative of the location of the various coal docks with respect to each other.

No. 1—Is the largest dock of the Northwestern Fuel Co., of which Mr. A. C. Jones is Vice-President.

No. 2—Is a retail dock known as the "Sargent" dock. It is operated by the Ohio Coal Co.

No. 3—Is the first dock on Rice's Point, and is under the proprietorship of the Northwestern Fuel Co.

No. 4—Is the Ohio Coal Co.'s plant, of which Mr. B. D. Smith, Jr, is agent.

No. 5—Is the dock of the Pioneer Fuel Co., Mr. Geo. E. Welles being the President of the company. This company also operates a coal dock of about the same size at Gladstone, Mich. The Gladstone dock is also of about the same capacity. From these docks they supply Minneapolis and St. Paul and the country tributary thereto. The general offices of this company are at Minneapolis.

No. 6—Is the only coal dock on Connor's Point. It is owned by the St. Paul & Pacific Coal Co., of which Mr. A. Pugh is General Manager.

Nos. 7 and 8.—These two docks belong to the Northwestern Fuel Co., both comprising their West Superior facilities.

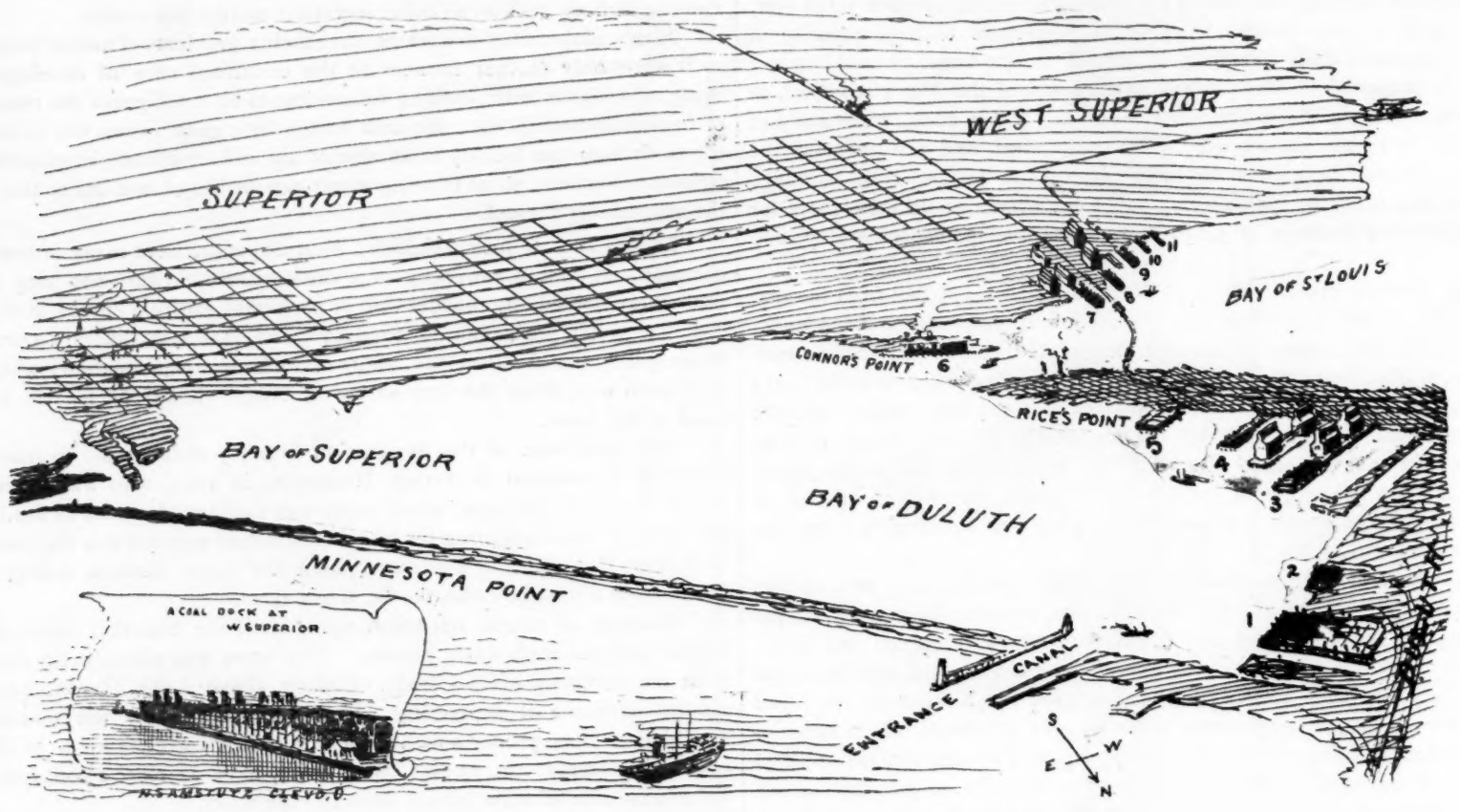
No. 9—The Lehigh Coal & Iron Co. operate this dock. Mr. C. P. White is their efficient Superintendent. This company are the first to start coke ovens to reduce coal to coke here, instead of doing so in the coal district. This movement will, no doubt, soon show the wisdom of the projectors in handsome returns. Fifty of these ovens are now in use and they will soon duplicate the present plant.

No. 10—The Ohio Coal Co. operate this dock. They also operate the coal dock upon the Wisconsin Central general merchandise pier, at Ashland, Wis.

No. 11—The Silver Creek & Morris Coal Co. operate the last coal dock on the Wisconsin side, in the direction toward Grassy Point, on the opposite side of the Bay of St. Louis. This is, nominally, the Philadelphia & Reading Co.'s receiving dock, the offices of which are in St. Paul and Chicago. Mr. Geo. Connery is Superintendent.

The vessel arrivals and clearances for 1888 were 2,200, with a tonnage of 1,943,236 tons; and for 1889, the tonnage of the vessel business reached 2,452,000, and the arrivals and clearances rose to 2,556.

Duluth also has a dry dock and Superior a ship-yard, where Capt. McDougall's new boats are built. The industries of this port are varied, manufacturing of all descriptions being carried on. The Duluth & Winnepeg Railroad project will, no doubt, promote the erection of ore docks, as soon as the line is completed to the iron range in Itaska county. The government expenditures for this port for 1889 on the Duluth side were $67,473.65, and upon the Superior side $42,653, or a total of $110,126.65.



BIRD'S-EYE VIEW OF DULUTH AND SUPERIOR HARBORS.

		N. W. Fuel Co.	Ohio Coal Co.	Pioneer Fuel Co.	St. Paul & Pacific.	Lehigh Coal & Iron Co.	Silver Creek & Morris Coal Co.	Sargent Dock Ohio Coal Co. Retail.	Total.
Number of docks		4	2	1	1	1	1	1	11
Docks in West Superior		2	1		1	1	1		6
Docks in Duluth		1	1	1				1	5
Docks on Rice's Point		1	1	1					3
Docks on Connor's Point					1				1
Fr'nt'ge devoted to coal	Superior	1,290	1,000		1,600	2,000	800		6,690
	Duluth	1,650	2,000	800				150	5,600
	Total	3,940	3,000						42,290
Width (ave.)		300	300	300	300	350	350	300	314.2
Number of derricks used		75	11	4	6	9	3	3	111
Kind of derricks		Hunt	Brown	Brown	Hunt	Hunt	Brown	Hunt	
Storage capacity	(tons)	500,000	300,000	150,000	225,000	275,000	125,000	20,000	1,595,000
Daily unloading capacity	(tons)	18,900	4,000	1,500	2,500	5,000	1,500	1,000	34,400
Annual handling capacity	(tons)	800,000	500,000	250,000	250,000	500,000	300,000	30,000	2,880,000
Daily transshipment to cars	(tons)	9,000	2,500	1,500	1,500	3,000	2,000	100	19,600
Square feet of dockage		1,312,500	900,000	240,000	480,000	700,000	280,000	45,000	3,957,500
Opening year of busin's	Superior	1887	1889		1883-84	1886	1890		
	Duluth	*1890	1882	†1881				†1881	

*Prior to †Since.

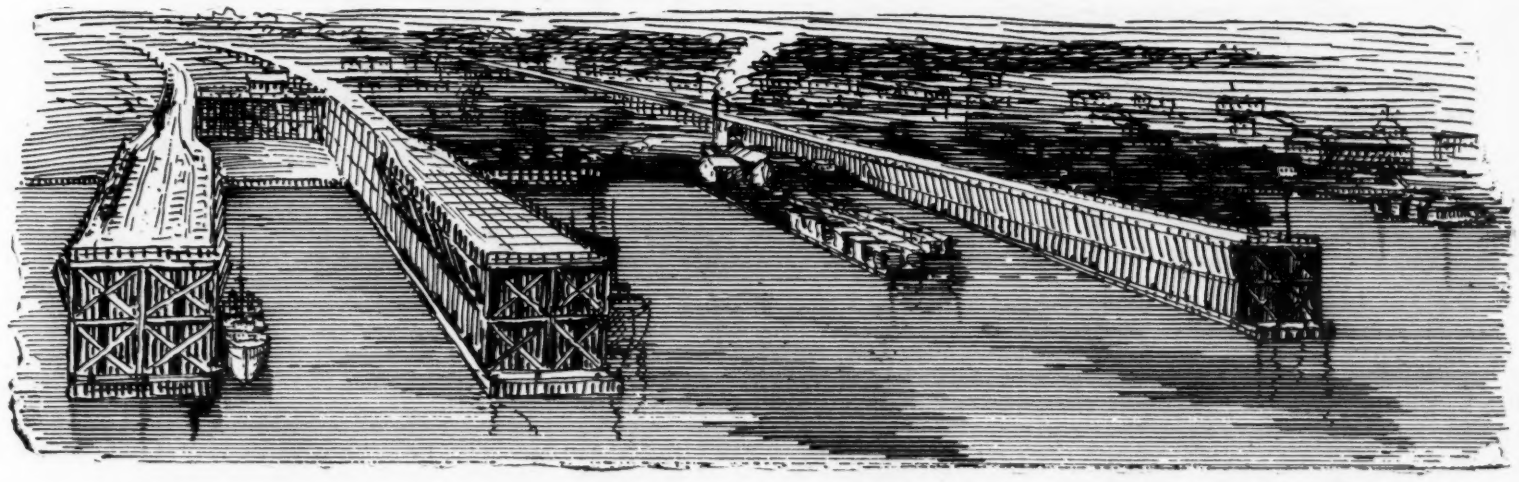
Superior proper was settled in 1853, the plat thereof being made in the next year. There were three different town site companies in the field, taking in Superior, Superior City and Middletown. Superior was what at present is known as Old Superior, Middletown being connected with it under this designation. Superior City is now Central Park Station. These old town sites, including what is now known as West Superior and Connor's Point, now comprise the City of Superior, Wis., incorporated in April, 1889. The St. Louis River is contracted to about 600 feet, between Rice's Point, projecting out from Duluth, and Connor's Point, extending into the channel from the Wisconsin shore. This point contains a large number of flour and planing mills, as well as the extensive coal docks of the St. Paul & Pacific Coal Co., several school houses and a population of some 1,500 people.

West Superior was platted five years ago. The site was anything but an inviting one, and presented an interminable mass of debris of the remains of the prowess of the native forests years previous, but laid low by devastating fires, etc. From appearances, the whole front almost defied penetration, looking more like a huge swamp or marsh, with little to attract the location of a pushing young city. Now this self-same waste is made to blossom as the rose. The land has been drained; a perfect network of railroad tracks stretches out in all directions; huge grain elevators, half a dozen in number, tower over the surroundings with sentinel stateliness, and the remnants of the five or six-years-ago waste are seen in unreached spots, where the dense undergrowth yet maintains itself, an evidence of past supremacy. Where the marsh of a half decade ago existed, now immense coal docks extend into the Bay of St. Louis. The largest fleets of lake vessels hail from adjacent docks. What yesterday was a forest primeval is to-day a projected metropolitan city of tremendous growth, in the few years since its inception.

In 1886 the first influx came, and in less than four years six large coal docks and as many large elevators have been built, these docks alone having an annual handling capacity of over one and three-quarter million tons of fuel—the greater part of the business of this port.

The following railroads center here or have connections with Superior and Duluth: Great Northern R'y Co., Northern Pacific, St. Paul & Duluth, Chicago & St. Paul, Minneapolis & Omaha, Duluth & Iron Range. Inter-communication between the different roads is effected through the Terminal Co.'s tracks. Superior has equal access to the lake, as has Duluth, by a natural channel between the end of Minnesota Point and the Wisconsin mainland.

I find myself very much indebted to the superintendents and representatives of the different docks for their valuable co-operation in making it possible to gather these interesting data.



THE MILWAUKEE, LAKE SHORE & WESTERN ORE DOCKS. THE WISCONSIN CENTRAL ORE DOCK.

GENERAL VIEW OF THE ASHLAND, WIS., ORE DOCKS.

ASHLAND.

This Lake Superior port is located upon the kindly disposed shores of Chequamegon Bay, which forms a land-locked harbor of sufficient depth to accommodate the lake vessels plying between this port and those of the lower lakes.

The early history of this vicinity is replete with stirring incidents in connection with the courageous explorations of the early missionary pioneers, such as Allouez and Father Marquette. These intrepid explorers planted a mission on Madeline Island, one of the Apostle group, at the mouth of Chequamegon Bay. The mission was located near the present hamlet of La Point, which is the oldest settlement in Northern Wisconsin, having its inception early in the seventeenth century.

The first cabin in what is now within the bounds of Ashland was erected July 5, 1854, by George Kilbourn and Asaph Whittlesey, who came over the bay from La Pointe with the determination of finding a town site. A large number of people from La Pointe visited the new town site, upon invitation of Capt. Moses Easterbrook, of the steamer "Sam Ward," on September 7, 1854. This steamer undoubtedly was the first one to land at the newly-formed town. The naming of the place was left to Mr. Martin Beaser, who, being an ardent admirer of Henry Clay, named it in honor of Clay's homestead. The postoffice name, however, until July 30, 1860, was "Whittlesey," and subsequently was changed to Ashland. The town was platted in December of 1856.

The first dock was built by Martin Beaser, in 1855, but was carried away. The imports of 1854 amounted to $981; in 1855, to $4,256. Four subsequent docks were built out of cribbing, but did not withstand the ice.

During 1856-7 many persons came, through anticipations of early railroad connections and the possible development of the adjacent mineral deposits. There came a lull in the influx, and the years '58-9 were, indeed, dark ones. For some subsequent years Martin Roehm and wife were the only inhabitants of the place, the exodous having added to the population of La Pointe, Bayfield and Ontonagon. In 1871 the tide again raised, and many old settlers returned. Eighteen hundred and seventy-two marks the commencement of work by the Wisconsin Central R. R. The rapid influx and the consequent reconstruction of Ashland during this year were very marked; the improvements in the town alone amounted to $244,800.

The construction of the Wisconsin Central road was commenced in 1872. In 1873 the road was completed from Ashland to Penoka. The project was not entirely consummated until June 2, 1877. The first dock in New Ashland was constructed by S. S. Vaughn, in 1872, which extended into the bay 1,000 feet. In 1881 about 250 feet of this structure was destroyed.

The Wisconsin Central general merchandise railroad dock was built in 1873, and extends into the bay 1,500 feet, the cost thereof being about $30,000. The Wisconsin Central ore dock has a length of 1,454 feet; the approach thereto is 1,600 feet, making a total length of the trestle of 3,054 feet. The height of the dock is 46 feet, and it is 38 feet wide. It contains 234 pockets, 117 on each side; each pocket will hold 125 tons, giving a total storage capacity of 28,000 tons; and the dock can handle 10,000 tons daily. The total frontage for loading purposes is 2,908 feet. The company use 1,750 ore cars for hauling ore from the mines to the dock; these cars have an ore capacity of 22 tons each, and are equipped with air brakes and the Jenny patent coupler. The train usually consists of 30 cars, and the longest haul from the mines is 60 miles and the nearest 44. The dock was built during the Winter of 1886-7. The first shipment was made in July, 1887. This year's business in shipments was 209,308 tons; for 1888, 372,091; 1889, 573,969; 1890, to October 1, 803,048 tons, and they will probably get out 100,000 more this year. The water adjacent to the dock is 20 feet; a channel 100 feet wide exists on

each side of the dock. Mr. J. W. Coria is the General Agent of the Wisconsin Central road, and Mr. E. J. Glavin is his assistant.

The mines shipping from this dock are the Ashland, Colby, Section 33, Palms, Montreal, Aurora, Iron Belt, Superior and Germania. The longest haul is from Bessemer and the shortest from Hoyt. The dock has an effectual frontage of 2,908 feet. The Iron Range was opened in 1885. Their present facilities will, undoubtedly, soon be materially enlarged. The Milwaukee, Lake Shore & Western Railroad has two ore docks located to the east of the Wisconsin Central dock. The docks are set forth in the tabulated list appended:

	Dock No. 1.	Dock No. 2.	Total.
Length of dock devoted to loading, in feet	1,420	1,420	2,840
Length of approach	600	600	1,200
Total length	2,020	2,020	4,040
Width	46	50	96
Total frontdge devoted to loading	2,840	2,840	5,680
Height at dock	39	44	*41.5
Number of pockets	234	234	468
Tonnage capacity per pocket	85	130	*107 5
Total storage capacity in tons	20,000	30,000	50,000
Daily handling capacity in tons	6,000	9.000	15,000

* Average.

This road was the first to ship the products from the Gogebic mines, at Ashland. Their yearly shipments have been:

	Tons.		Tons.
1885	120,000	1888	645,000
1886	725,000	1889	910,000
1887	830,003	1890*	950,000

* To October 1.

The Milwaukee, Lake Shore & Western Railroad operates the docks, having Mr. M. Schrank as Agent, and Mr. C. H. Hartley as Superintendent. The road use in their ore business 1,200 cars, of 22 tons capacity each. Their cars are equipped with air brakes and their trains consist of 28 cars. The longest haul is 55 miles, from Wakefield, Mich., and the shortest, from Hurley, Wis., 45 miles. The docks were opened in 1885. There are at present the following mines shipping their ore over these docks, viz.: The Sunday Lake, Brotherton, Anvil, Federal, Ruby, Mt. Hope, Pabst, Aurora, Norrie, East Norrie, Germania, Windsor, Cary, Superior, Odanah and Father Hennepin.

The total frontage of this port devoted to the loading of vessels with ore reaches 8,588 feet, while the provisions of pockets in numbers is 702, and the aggregate storage capacity reaches 78,000 tons; the daily handling capacity is represented by 25,000 tons. About thirty mining properties are served and the amounts of ore handled are constantly increasing. The aggregate shipments to October 14, 1890, were 1,818,063 tons, while for 1889 1,500,000 tons were shipped- The large ore docks represent of themselves upward of a million dollars investment each, and demanding over 5,000,000 feet of lumber for each one in their construction.

The Wisconsin Central general merchandise dock is also used as a coal dock, which is operated by the Ohio Coal Co., and the Columbus & Hocking Coal & Iron Co. operate a coal dock adjacent to the Lake Shore ore dock. These two constitute the coal handling facilities of Ashland, yet by their docks over 200,000 tons of coal were handled in 1889. Their characteristics are embodied in tabulated form:

	Ohio Coal Co.	C. & H. Coal & Iron Co.	Total.
Frontage ..... feet	700	610	1,310
Width (ave.) ..... "	300	250	275 (ave.)
Number of derricks	4	5	9
Storage capacity ..... tons	75,000	50,000	125,000
Daily unloading capacity ..... "	1,200	1,200	2,400
Annual handling capacity ..... "	12.500	150,000	275,000
Daily transshipping to cars ..... "	1,000	600 to 700	766 (ave.)
Receipts, 1887	*25,000	36,900	.....
" 1888	*50,000	96,000	.....
" 1889	*80,000	125,000	.....
" 1890, about	*100,000	*135,000	.....

*Estimated.

The Ohio coal dock is at the foot of Ellis street, near the Chequamegon hotel. Mr. Geo. W. Miers is Superintendent, while Mr. T. F. McCarty manages the business of the Columbus & Hocking Coal & Iron Co. Both of these docks were opened in 1887. I am much indebted to the superintendents of the coal and ore interests for their hearty co-operation and assistance in gathering the data for this article.

MARQUETTE.

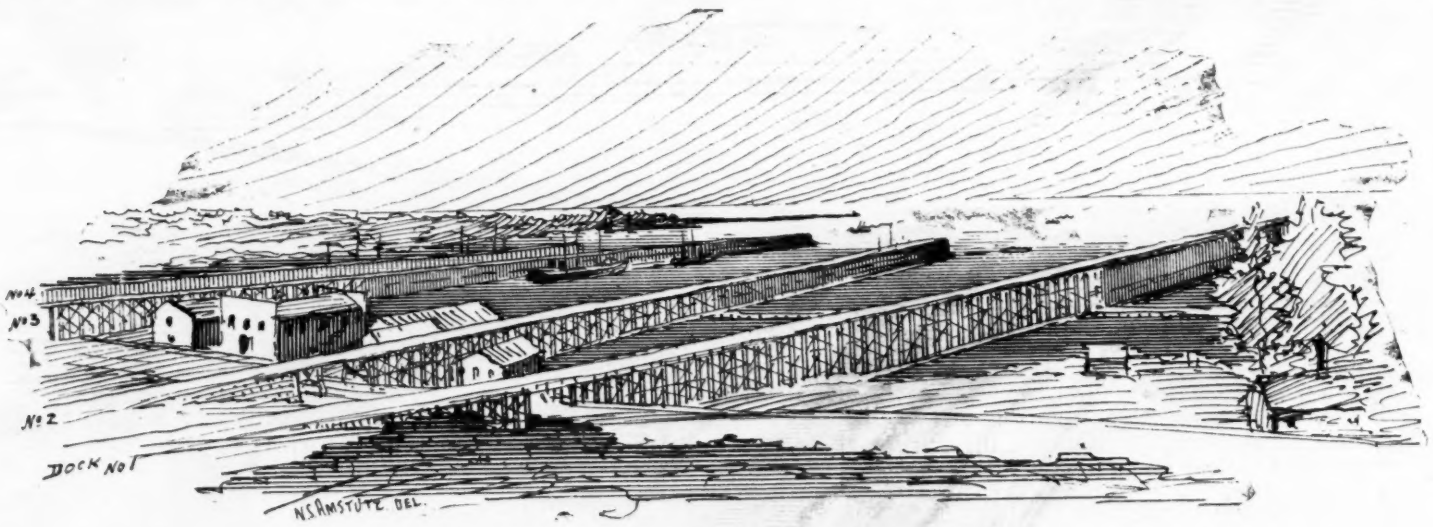
The early history of Marquette is contemporaneous with the carrying out the Government surveys of the upper peninsula, and indeed, the last half century is the time in which the country as well as the city of Marquette, have received the kindly touch of civilization.

In 1852, when the first railroad in the upper peninsula was projected through the then wilderness of Marquette county, from Iron Bay to Michigamme, there were only a few houses to mark the present site of Marquette, these pioneers having embarked from Mackinac in April, of 1849, and traveled by boat up the Sault river, and thence again by boat from the Sault to Iron Bay. The place was first named Worcester, in honor of the native place of Mr. Harlow, one of the first settlers.

In the words of Peter White, one of the first settlers of Marquette, "a few houses, a stumpy road, winding along the lake shore; a forge, which burned up after impoverishing its first owners; a trail westward, just passable for wagons, leading to another forge (still more unfortunate in that it did not burn up),and to the undeveloped iron hills beyond; a few hundred people, uncertain of the future—these were all there was of Marquette in 1851-52."

What changes have taken place in the intervening years! What was then a primitive frontier town is now a thriving city, which very fittingly, in its own name, perpetuates the memory of the early missionary and explorer, Father Marquette, who spent his life in the interest of the upper peninsula.

The first railroad was completed in 1858, to Michigamme, tapping



GENERAL VIEW OF MARQUETTE HARBOR.

the important iron interests intervening. The Elys, of Cleveland, associated with them two Boston capitalists, and constructed the road, at an outlay of $1,500,000 for the forty miles of track. The road was first known as the "Iron Mountain," the name having successively been changed in the following order: The Bay De Noquet & Marquette, the Marquette & Ontonagon, the Marquette, Houghton & Ontonagon, and lastly to the Duluth, South Shore & Atlantic, which road operates the coal and ore docks of Marquette.

I was greatly assisted in the compilation of these data by the many extended favors of Mr. W. F. Fitch, the efficient General Manager. The first shipments of ore were made in 1856, and from that time to the expiration of the first decade of the ore traffic, there were shipped 1,315,665 tons, and in the succeeding ten years the total reached 7,253,012 tons, and from 1876 to 1886, 8,109,349 tons; and for the last four seasons the transshipment to vessels have been, for 1887, 449,796; 1888, 991,141; 1889, 1,520,886 tons, and 1890 shipments to October were 1,091,517 tons; and those of October and November will swell the annual output to over 1,500,000 for 1890, or near to 5,000,000 tons for the last four seasons. The first decade of operation shows an average output of 131,566.5 tons per year, the second following with 725,301.2 tons as a yearly average, and the third leads the first by over 600,000 tons, showing an average yearly shipment of 810,934.9 tons. And yet the last four seasons outrun the average per year for the last ten years preceding 424,300 tons. From these comparisons it is evident that the ore business is destined to grow in a much larger ratio in subsequent transactions than it has ever attained in the past.

The fact, however astounding, yet remains, that all this remarkable development has been reached in three score and four years.

Herewith is appended a table showing the shipments from Marquette per year since 1867:

1856 to 1866 inclusive	1,315,665	1879	585,067
1867	466,076	1880	741,386
1868	507,813	1881	798,796
1869	633,238	1882	1,122,016
1870	856,471	1883	875,878
1871	815,379	1884	1,667,190
1872	952,055	1885	881,897
1873	1,167,379	1886	973,249
1874	985,488	1887	949,796
1875	910,840	1888	991,141
1876	458 273	1889	1,520,886
1877	561,743	1890	1 316,353
1878	552,127		

The capacities of the ore and coal docks, and interesting data in connection therewith, are graphically set forth in the following table:

Ore Docks.	No. 1	No. 2	No. 3	No. 4
Length of dock devoted to loading.....feet	1,758	660	1,238	1,238
Length of dock approach..... "	247	260	310	382
Height of dock..... "	45	36	39	47
Width of dock..... "	40	40	51	32
Number of pockets.....	270	91	213	200
Frontage of dock for loading..... feet	3,516	1,320	2,476	2,476
Capacity of pockets, each (ave.).....tons	100	40	65	145
Total capacity of dock in pockets..... "	27,000	3,640	13,845	29,000
Daily loading capacity of dock..... "	8,000	1,500	4,600	7,000
Annual handling capacity..... "	1,000,000	200,000	700,000	1,000,000

Coal Docks.	No. 1	No. 2
Frontage of docks.....feet	1,800	600
Width of docks..... "	85	60
Number of derricks.....	8	.....
Daily handling capactity, unloading.....tons	2,000	500
Daily handling capacity, loading on cars..... "	2,000	500
Annual handling capacity..... "	150,000	10,000
Storage capacity on dock..... "	20,000	5,000
Storage capacity on trestles..... "	500	.....

The total length of the four ore docks, which is devoted to the loading of vessels, reaches 4,894 feet, which have a frontage on either side. The total frontage of the ore docks of this port is 9,788 feet; the combined length of the approaches is 1,199 feet, which, added to the total length, amounts to over one mile of dock structures, the average eight of which is 41.75 feet above the water. They represent a combined width of 163 feet, being an average of 40.75 feet. The total number of ore-holding pockets reaches 774, having an average capacity of 94.87 tons and an aggregate storage capacity in the pockets of 73,485 tons. The entire plant for handling ore in transshipments to vessels has a daily handling capacity of 21,100 tons and an annual handling capacity 2,900,000 tons. The depth of water adjoining the docks is ample for all lake craft.

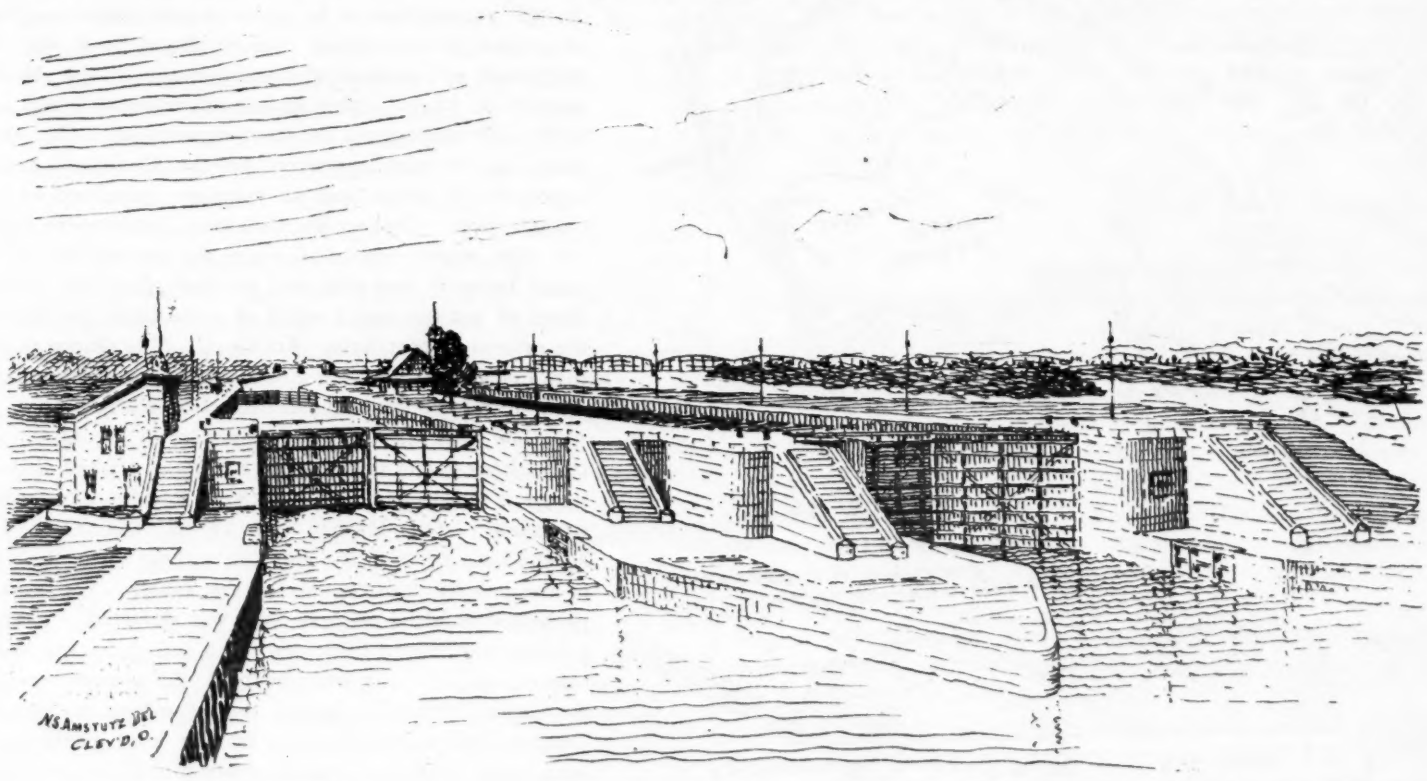
The coal docks are known as the Spear dock, or coal dock No. 1, which is operated by F. B. Spear, and is located between ore docks Nos. 1 and 2; while No. 2, known as Pickands & Co.'s dock, operated by the D. S. S. & A. R'y Co., is located between ore docks Nos. 3 and 4.

These extensive ore handling facilities at Marquette consist of three old and one new dock just built in 1889-90, which is known as the No. 4 dock. Dock No. 1 was first operated in 1884, and at that time consisted of 2,318 feet frontage, having 170 pockets of 90 tons each, thus giving a storage capacity, in pockets, of 14,600 tons. The first year's shipments of dock No. 1 were 301,991 tons. In the year 1865 dock No. 2 was erected, and in 1869 No. 3 was also placed in operation, which, including the last or No. 4 dock, a total frontage of 9,788 feet and a storage capacity of 73,485 tons is reached, giving about 95 tons per pocket.

The railroad was first built to Ishpheming, in the year 1857, and was known as the Iron Mountain road. In 1883 it was extended to Houghton, and in 1888 its western terminals reached Duluth; in 1887 the eastern end reached Sault Ste. Marie, the line having been built from the "Soo" junction. From Marquette to St. Ignace the road was opened in 1882, and was first known as the Detroit, Mackinac & Marquette Railroad. The extension to Houghton was named the Marquette, Houghton & Ontonagon Railroad, while upon the completion of the line from the "Soo" to Duluth—opening up an international artery of commercial communication—in 1888, it has since been known as the Duluth, South Shore & Atlantic, giving to its patrons a panoramic presentation of Lake Superior scenery, such as is not approached by any line traversing the Northern lake region, and combining with its diversified and beautiful scenery a handling capacity for the transportation of vast quantities of ore from the mines which, undoubtedly, is second to none in all the iron ore region. The road has in the ore traffic about 3,500 cars, 3,000 holding an average load of seven tons per car, and 500 of 20 tons each; and its trains to the mines usually consist of some 65 small or 26 large cars, while the return trip is made with a train of a like number of cars. The longest haul is from Michigamme, a distance of 40 miles, while the shortest is from Negaunee, a distance of 11 miles. The ore docks are under the management of Mr. H. B. Bell. The erection of the new ore dock evidences a growing traffic from the iron ranges and a thoroughly energetic spirit, in which this company adapts itself to the increasing output year by year.

"THE SOO."

Sault Ste. Marie was the early home of the hardy and intrepid frontiersman and his abode during the many incursions along the river St. Mary's



THE PRESENT LOCK. THE LOCK NOW BUILDING—WHEN COMPLETED.

THE "SOO" LOCKS.

in quest of a hunter's livelihood. The early history of this vicinity is full of interesting incidents and replete with attainments of daring and deeds of heroism. The legends of these early days are essentially Indian in their composition.

The forefront of civilization in its westward march toward the Occidental sun was of a penetrative character. Dense forests, Winter's abounding snows, nature's van guards of animal inhabitation, and the ever present red man were no obstacle. The forests yielded their growths of ages to make the new habitations tenable and afforded protection against the inanimate as well as the animate elements of nature. The prevalent snows afforded the first means of primitive transportation by land, and the attendant cold made subservient to the sturdy woodman the streams whose waters were not too much agitated by rapids, etc., while the animal kingdom paid tribute to the keen aim of the hunter to supply his larder.

Undoubtedly the early establishing of a mission at this place, in 1641, by Peres Isaac Joques and Raymbault, was among the first steps toward the founding of the place by them called "Sault de Ste. Marie." Thus, two and one-half centuries ago, the intrepid and courageous missionary planted

the first seeds of civilization. Early explorations in radiating directions were pressed with vigor by the French and subsequent British traders.

The waterways for transportation were employed by other than birchen barques in 1770, when the first large sail boat was seen in Lake Superior. It was built by Alex Henry, at Point-aux-Puis, some 12 miles above the Sault rapids.

Four commercial bodies transacted business on Lake Superior in 1829, having the vessels Discovery, Otter, Mink and Recovery in the employ of the American, British, Northwestern and Hudson Bay fur companies.

The Discovery was lost in an attempt to run the rapids, and the Invincible was wrecked at White Fish Point in 1823. The Recovery lay hidden in the vicinity of Isle Royal during the war of 1812, and in 1829 she was safely run down the rapids and sold to Merwin & Giddings, of Cleveland. The John Jacob Astor, named after the renowned fur merchant of these days, was built in 1835, by Capt. G. W. Jones, and was in

charge of Capt. C. C. Stannard. In September of her first trip, Stannard rock was discovered by her crew and named in honor of her master.

These early vessels upon the upper lake, the Superior—the greater of the inland bodies of fresh water—were, of course, constructed upon its shores or upon the banks of some tributary bay or stream.

This marine activity of a pioneer order ere long began to open new avenues of trade, making accessible remoter points and bringing into the hands of the projectors reward for the arduous toil incident to the mastering of their small sized craft upon the large lake forming the water highway of the time. How bountifully the hand of nature supplies the needs and becomes the servant of a higher creation.

In the primitive state of our Western civilization, a new era dawned when the hardy pioneer hazarded his all to develop a land which, in its due time, should "blossom as the rose," and its waters sparkle with the brilliancy of modern settings of commercial gems upon its bosom.

The whole of the upper peninsula of Michigan was a wilderness up to 1845, and all the remarkable developments which to-day are looked upon with the very matter-of-fact "been so ever since we know" sort of reasoning, have been made in the last 45 years. How remarkable! The very rapidity of modern achievement seems to instill in the participants a spirit of enterprise which accomplishes great results in increasingly large ratio. The large iron ore deposits in the upper peninsula, which have built up such a magnificent lake marine, were first discovered by government surveyors. To Mr. Burt and Dr. Houghton, State Geologist, undoubtedly belong the distinction of locating iron ore in Marquette county, in 1844, and on September 19th, 1844, William A. Burt secured a specimen of ore from the location that is now known as the Jackson iron mine. Gradually the activities in the upper lake region were felt in the transhipment at the "Soo" of such commodities as the commercial attainments of the day demanded, being reloaded upon the lower lake vessels.

Under this order of things the first railway in the upper peninsula was projected, from Marquette to Michigamme, directly through the iron region, in the year 1852, by Heman B. Ely, Samuel P. Ely, George H. Ely, John F. Ely and Hervey Ely. In 1856, Boston capitalists associated with the Elys, and two years later the road was an accomplished fact, having been constructed at a cost of about $1,500,000, with a total length of some 40 miles. The date referring to the construction of this road is here inserted with the hope of showing the industrial awakening that dawned with the fifties.

The vessels constituting the Lake Superior fleet prior to the opening of the Sault canal were: five schooners, of 40 tons each; one of 50 tons; three of 70 tons and one of 180 tons; the propeller Independence and steamer Julia Palmer, of 280 tons each. The steamer Independence was the first steamer brought over the Sault portage on "ways." The first formal announcement by governmental authority, respecting a ship canal to circumvent the rapids at Sault Ste. Marie, was embodied in Governor Mason's message to the Michigan Legislature in 1837, urging its immediate construction and setting forth quite extensively its great importance. On March 21st, 1837, an act was approved by the Governor, authorizing a survey to be made and an estimate submitted of the cost of construction. Twenty-five thousand dollars were appropriated.

The report embodied plans for a canal of two locks, the canal being 75 feet wide and ten feet deep, the locks having a depth of ten feet and a width of 32 feet and length of 100 feet, the estimated cost being $112,544. The plan was laid before the Legislature and an additional appropriation of $25,000 made to be applied to the construction work.

The work was actually commenced in May, 1839, but, through a conflict between the State and United States authorities, was abandoned, after $1,876.56 were expended in construction. On March 30th, 1840, the State Legislature adopted a memorial to Congress, setting forth the importance of the speedy construction of the canal. The memorial was presented before Congress, but was defeated. Among its opponents was Henry Clay, who, in a speech against the measure, referred to it "as a work beyond the remotest settlement in the United States." Should the renowned statesman see the present attainments, fostered by the wise provision of canal connection between Lakes Superior and Huron, the trite saying of Bishop Berkeley, "Westward the star," etc., could not but convince him that this saying has found a profound realization in the stirring events of the last quarter century.

The canal matter rested until January 24, 1843, when the Legislature again presented the matter before Congress, but failed in securing any direct money support, though Congress gave its sanction to the disposition of 750,000 acres of land to raise the necessary funds to complete the project. After 16 years of labor, the project finally began to assume definite shape. The canal was to be completed in two years, the contract being let on April 5, 1853. The length of the locks in the contract plans was to be 250 feet, but, at the urgent request of vesselmen, the length was increased 100 feet, making their size as follows:

The plans contemplated two consecutive locks 350 feet long, 70 feet wide, with 12 feet of water; the depth was, however, increased to 13 feet. The width of the canal was planned at 100 feet, and the estimate, covering the cost of construction, was $557,739.

On August 25, 1853, the original contract was transferred to the St. Mary's Falls Ship Canal Co., a company composed of New York capitalists, incorporated by an act of the New York Legislature on April 12, 1853, Erastus Corning being the President of the Canal Co.

The ground for the construction work was broken by Mr. Chas. T.

Harvey, Superintendent, on June 4, 1853. On the 21st of May, two years later, the work was completed, the actual cost having been $999,802.46.

The gross receipts of the canal in 1855 were $4,374.66, upon a tonnage of 106,296. The locks closed for the season on November 23. Two decades later the receipts rose to $41,199.04, and the tonnage to 1,259,533.53, the canal for this year (1875) opening May 12, and closing December 2.

Superintendent Geo. W. Brown, in his report of 1864, with a great deal of foresight, recommended the early enlargement of the canal facilities. In 1869 an effort was made to interest Congress in the project of enlarging the canal, but the efforts at the time were fruitless.

In July, of 1870, Congress appropriated $150,000 for the improvements sought for. Gen. O. M. Poe, by direction of the Secretary of War, reported favorably upon the improvements, and claimed the demands of commerce warranted the construction of an entire new set of locks. The plans were for two locks, but, after consultations, etc., a deep single left lock was decided upon. The first contract was let on October 20, 1870, and eight subsequent contracts were let before the work was entirely completed. This lock is 515 feet long, 80 feet in the chamber and 60 feet at the gates. From the bottom of the lock to the top of the coping is 39½ feet. At a normal height of water there are 16 feet above the miter sill. The lock will hold 9,988,000 gallons of water; fully $2,000,000 have been expended upon the structure. The work was completed in 1879.

The present lock has been in use a decade, and even now a still larger work is under progress—the removal of the 1855 lock and the replacing thereof by a structure 800 feet long and 100 feet wide, with a depth of 21 feet above the miter sill. This work was commenced during 1889, and about one-half the excavation has already been made.

The recent appropriations by Congress makes possible the letting of one contract for the entire work, thus facilitating the early completion thereof. The commercial importance of this water highway is so well known that a repetition of facts pertaining thereto would at this time not add to the evidence, if any is needed, to set forth the claims for earnest attention on the part of Congress to this highway of the people. A few years more will be needed to complete the structure. In conjunction with this national improvement, the perfecting of the new Hay Lake channel is of comparative importance, in that when completed it will save fully eleven miles from Detour to the "Soo." Instead of taking the East Neebish rapids as vessels come from Mud Lake, going up, and passing around Sugar Island, through Lake George and Little Lake George, the island is left to the right and the passage leads through the Middle Neebish rapids, and thence into Hay Lake, in a comparatively straight line from the little rapids at the head of Sugar Island. Besides being a saving of eleven miles in distance, the entire course is in United States territory. This work has progressed considerably. The greater part of the work of cutting a channel through the middle Neebish has already been attained. But there yet remains a large amount of work in effecting a navigable channel through the little rapids and the removal of a small island at about this point. Undoubtedly, the entire contract for the completion of the new lock will be let the coming Winter, so that work may be commenced in the early Spring.

The general view of the locks, both the present one and the one under construction, I was able to make from data, etc., and a photograph, which I was opportunely enabled to take from the bow of the Minnesota Steamship Co.'s steamer, Mariska, as she lay below the lock preparatory to being locked through. I find myself much indebted to the Assistant Superintendent of the canal for many favors extended, as well as the Minnesota Steamship Co. for many courtesies.

The present appropriations stand, $900,000 for the lock, and $400,000 to the credit of Hay Lake channel, to make a 20-foot channel.

The Sault river should be so lighted that passages could be made at night, and, as a point in favor of a plan embodying this feature, it may be said that the Suez Canal, being a straight passage, without lighting, 41 per cent. of the vessels passed during the night, and when properly lighted the passages increased to 71 per cent. The commercial comparisons of the Suez Canal with the Sault Ste. Marie locks are decidedly to the disadvantage of the oriental enterprise, however renowned it has become. Since the Hay Lake channel is to be 20 feet in depth, it would be to the advantage of lake shipping if a 20-foot depth were aimed at in the approaches to all the lake ports and the channels connecting the larger bodies with each other. The maritime industries need to be fostered; no embargo should be placed upon their being an essential factor in the industrial expansions and developments by insufficient waterways.

ESCANABA.

Escanaba, located upon the west shore of Little Bay de Noquit, in Menominee county, at the northern extremity of Lake Michigan, is the natural outlet of the products of the Menominee iron district. The Chicago & Northwestern Railroad brings the ore from the mines to this port, which enjoys the distinction of making earlier and later shipments of ore than any other lake port.

The company operate four docks, three being 1,200 feet long each, and one of 1,500 feet in length, making a total of 5,100 feet. Of this length, the greater portion of both sides is available for loading, which gives 7,800 feet for this purpose. The length of the approaches is 1,200 feet, leaving a net length of 3,900 feet for loading purposes. The docks are 38 feet wide, and at the docks the superstructure of two of the trestles is 40 feet, and two of 48 feet height. These docks contain 826 pockets, 392 holding 100 tons each, and 435 have a capacity of 135 tons each, making a total storage capacity of 97,790 tons. They have handled 39,880 tons in one day, though this would hardly represent an average per day, being rather above the average amount. Their ore cars have a capacity of from seven to 24 tons each, all the large cars being equipped with air brakes. The docks were first opened for business in 1865, and the ore shipments since then have been as follows:

Year.	Tons.	Year.	Tons.
1865	31 072	1878	5?6.891
1866	116.?63	1879	?96,203
1867	196,86?	1880	1 171,7?3
1868	269,295	1881	1,463,190
1869	331.650	1882	1.7?6,454
1870	413,786	1883	1,426 876
1871	447,253	1884	1,356,587
1872	481,932	1885	1,2 9,778
1873	453,9 6	1886	1 53? 824
1874	289,347	1887	2,072,867
1875	264 084	1888	2,203,199
1876	38?,937	1889	3,0?3,63?
1877	397,194	1890 (To Nov. 1)	3,3?8,74?

A new outlet for ore by rail from the different iron ranges of the upper peninsula is soon to be effected over the new Escanaba, Iron Mountain & Western Railroad. When all completed, the road will be about 130 miles long. At present 54 miles between Escanaba and Iron Mountain are graded, and the rails have been laid for a distance of 25 miles. This road is built in the interests of the Schlesinger syndicate, and, no doubt, next season will see the total ore shipments reach the highest point attained by any shipping port of the upper lakes, not only more than any one other port, but several of them combined.

For our information, we are indebted to the agent, Mr. H. A. Barr.

C. S. Austin

"ON TO RICHMOND" WITH THE MECHANICAL ENGINEERS.

No doubt, in common with the other technical and trade papers, you will have given your readers an account of the Richmond Meeting of the American Society of Mechanical Engineers, held in November, 1890. This account will, I presume, give the title and perhaps a synopsis of the contents of each paper, the debates thereon and the names of the officers chosen for the coming year. All this is valuable and desirable information for your readers, but I, for one, wish that some of the "press gang" who attended that meeting would vary the usual reports by a description of the social side of the occasion. This, I know, would be a somewhat difficult thing to do in a manner that would be at all adequate to the occasion, or satisfactory to those who enjoyed the bountiful hospitality of that city at that time.

I have myself no ambition to venture on ground that wiser correspondents have hesitated to occupy, but it would be, I know, a gratification to many of the engineers and their better-halves who were there, to see, somewhere, an acknowledgment of the whole-souled, hospitable manner in which the Society of Mechanical Engineers were received by Richmond's best citizens. The eloquent address in which his honor, J. Taylor Ellyson, Mayor of Richmond, greeted and welcomed the engineers and their guests to their city, if wider known, would have warmed other hearts as it did those who listened to him. His reference to the old times, in which the young men of Virginia were trained to politics, to discussions of taxation and finance, etc., while it had in tone and thought a shade of tender recollection, was soon changed to a cheery hopefulness for the future, now that the rising generation were being taught in manual training schools and mechanical institutions to direct their thoughts and energies in other and more useful occupations.

I wish, too, some one could have drawn a pen picture of the reception given the engineers and their wives, by His Excellency, General Philip J. McKinney, and his estimable wife, in the colonial mansion which, for a hundred years, has sheltered the successive Governors of the Old Dominion, and in whose halls the beauty and chivalry of its ancient families had gathered generation after generation. As the guests passed to and fro, meeting here and there gray-haired representative men and women, and looked on the ancient portraits that hung upon the walls, there would come ever and anon thoughts of the scenes that had been enacted;

thoughts of the gallant youths who, in the long ago, whispered tales of love that evoked smiles from beauteous eyes, now dimmed with age or closed in death. Aliens as were we all to the old commonwealth, the warm grasp of the hand, the beaming eye and the spoken words, left no doubt of our welcome to their homes.

I wish, too, some one could have sketched the scene within the old Tredegar Iron Works, a works whose history as a famous machine and gun foundry reaches back to a time when the oldest member present was wrestling with the old-time tools as an apprentice.

Here, in a large upper room, from which the machine tools had, for the occasion, been removed, the shafts and pulleys only showing what it had been, with freshly-whitewashed walls and beams to garnish it for the festival, long lines of tables were spread with a bounteous feast of good things, both solid and fluid; and, while the Tredegar Works, like many another old timer, has had its ups and downs, all voted it a glorious success that day. After a long and vigorous onslaught, such as only engineers can make when well-spread tables tempt them, there came a halt, and knife and fork and busy tongues held silence while the venerable President of the company, General Anderson, who, at the age of 80 years, looked backward over a life spent within its walls, and in charge in various capacities of its affairs, gave, at the request of the guests present, a brief history of the establishment. Outlining its early beginning, and naming its founders, he spoke of his lifelong connection with its management, and, as he called up with tender recollection his associates, and meted out to each his award of praise for all they had done to lighten his labors in the past; and, as he recited how the grave had long since claimed so many of them, his voice grew low and tremulous, and the stillness that reigned all about gave testimony that in other hearts by gone remembrances brought back tender thoughts as well. Responses by President Oberlin Smith and others revived the duties and scenes of the present to such an extent that the very rafters were made to ring with cheers for General Anderson, the Tredegar Works and its employees.

After this sought-for correspondent had well accomplished the description of these scenes and events, I would have had him try his hand at describing the reception and supper given by the citizens, under the auspices of the Chamber of Commerce, in the Richmond Theatre, the parquet of which was floored over and its balconies and boxes decorated for the occasion. Here again Virginia's capitol turned out its handsome women and most noted business men, and, to soft music, light tripping feet wove involute curves over the newly laid floor, in which the gallantry of the Mechanical Engineers found scope and pleasure in leading out the daughters of the Sunny South. In an adjoining building elegantly arranged supper tables invited attention—and received it, too. Amid the merry clatter of plates that were filled and handed about by the business men of Richmond, who, so jealous were they of the honor of hero entertaining the American Society of Mechanical Engineers, that even in the arrangement and decorations of the tables they would not permit woman's hand or woman's taste to share it with them. There was a ceaseless running accompaniment of conversation, the burden of which was "how beautiful, how tasteful."

I have only outlined what I have wished some writer had found time and words to tell, and to which he, no doubt, would have added a sample of the pleasant things that were said to us by our hosts, at all times and in every place. Having thus sketched a programme of what should have been written by others, I will undertake, on my own account, to relate an incident of which I was an eye-witness.

Among the excursions planned for the pleasure of the engineers and their lady friends, was a trip down the historic James river, to visit the seven monitors that so peacefully float not far from the now dissolving fortifications of Drewry's Bluff. Lying with overlapping ends, which permit a ready access from one to another, and behind a picket fence of driven piles, they float in inglorious ease, manned with officers and crews detailed to keep them in presentable appearance. On our arrival, we were permitted to go wherever we chose, and it was an interesting sight to see men and women climbing up to the turrets, squeezing through port holes, diving down companion ways into engine rooms and boiler compartments, stumbling over pipes in dark and crooked passages, and in and out of mess rooms, to be seen only by the aid of the dim light of the guide. It was in one of these narrow and dark gangways I met a well-known engineer groping his way out, and, to my inquiry as to where he had been, he said: "I have been hunting up the little room I occupied during the siege of Charleston."

"Did you find it?" I asked.

"Oh, yes," he replied, "and a mighty little place it is, too."

Finding that he was familiar with the vessel, and that the interval of a quarter of a century had not dimmed his remembrance of his life on board, I followed him with much interest, as he described the various parts of the vessel and its machinery. After telling us how the dimly seen and rather odd looking engines were handled below, we went up into the turret to find the place to which he was assigned during the fight, and to learn what was the part he had taken in that famous bombardment. In the turret of the Montauk lie, side by side, two mammoth Dahlgren guns like docile twins resting in peaceful repose; but, as you stood beside them, and recalled the deep dents on the outside iron walls, it was not hard to imagine that with 14 men working at their utmost within that cramped space, in handling, loading and firing these belching dogs of war, supplemented with the thwacks of the iron hail the confederate batteries poured on them, the orders from the captain above, the shouts of the gunners within and the rumbling of the machinery below, the scenes of those eventful days must have been far different from what it was as we stood in silence there. In response to an inquiry as to what his duties were, and how the machinery of the turrets and guns was operated, the engineer took his place at the rear of the guns and between them, and said:

"It was my business to handle the machinery that moved the turret, so as to train the guns as directed by the captain in the pilot house above; and then to swing them half around after being fired, so we could load them while safe from the shot of the rebels. You see that heavy bent wrought iron shaft at the mouth of the guns, and just inside the ports, and between them and the muzzle of the guns? This shaft was called a port stopper, and was designed by Ericsson to stop the port holes while the guns were being loaded, but there was so little space between the guns and the port stopper. It was a slow job to swab the guns and get the load in, although, as you see, the handle of the swab that hangs over your head was made telescopic. We found it easier to turn the turret half round while we swabbed and loaded the guns, and then swing it back again into position for firing. I see you wonder what that padded canvas is that is hung all around the inner walls of the turret. It is not intended for ornament, but it is to keep the nuts from flying off the turret bolts when struck by a cannon shot on the outside, which would otherwise make it very dangerous for those inside." "What moved the turret?" some one asked. "Well," said the speaker, "down underneath, in the hold, are two steam cylinders connected at right angles on a shaft, which is geared to the turret, and by which it can be turned to the right or to the left. As I said, I stood right here during the fight, and down behind here somewhere is a lever—let me see, where is that lever?' 'And reaching down in a recess behind him, aided by the dim light that came in through the port hole, he found the lever that 27 years ago, he, as a young man, had grasped with energy and moved with a will.

"Oh, there it is," he said, pulling it up. "It's many a long year since I had hold of it, but I was sure it was here somewhere. Well, when the lever was pulled this way, the turret would move to the right; and when I pushed it that way, it would move to the left, and as it stood in the middle, the turret would stand still."

It was a simple tale, told without boasting, and, perhaps, without much thought as to what it revealed; but just think it over—think of coming back long after the war was over; long after many who had survived its perils had surrendered to a sterner foe; long after companions in arms had scattered far and wide, to find, on this visit, the old, much-dented monitor, its sleeping guns, its unused engines, its empty boilers, its vacant bunks and its deserted mess rooms, but in the old place, the throttle valve handle, the starting bar lever which, long ago, swung these ponderous guns and heavily clad turret, and by which its shots slowly traversed along the line of the land batteries until, as my engineer friend said, as he laid his hand lovingly on one of the guns, "I had at last the good fortune to train this gun so that its shell found the magazine of Fort Moultrie and sent it skyward, and a splendid sight it was."

The luncheons have been eaten, the band has gone ashore, and the Mechanical Engineers, who had the good fortune to attend the Richmond Meeting of 1890, have scattered far and wide; but, be they where they may, they will long hold in pleasant remembrance the hospitable welcome and kindly entertainment they received in Virginia's capital, and none will wish more earnestly than they that, in the near future, aided by the genius and skill of the engineer, and the labors of the artisan, there shall arise above the ruins of a by-gone dynasty a splendid city, where wealth, wrung from the hidden treasures of earth, shall bless, not only its possessors, but, as well, the entire community and the world at large.

J. H. Holloway

NEW YORK, December, 1890.

THE Akron *Daily Beacon*, one of the most enterprising inland dailies in the West, recently celebrated its 21st anniversary, giving figures showing steady and substantial growth. Congratulations,

FOR AND AGAINST PIG IRON WARRANTS.

In order to obtain an expression of the iron trade regarding the policy of introducing the pig iron storage warrant system into this country, *The Iron Trade Review* recently addressed the following inquiry to the managers of all the blast furnaces, rolling mills and steel works whose names appear in Swank's "Iron and Steel Directory:"

In view of the general interest manifested in the discussion now going on regarding the introduction of the pig iron storage warrant system into this country, will you kindly give us your views, either on the enclosed postal card or at greater length, if you so desire, and greatly oblige,

Yours very respectfully, W. M. DAY,
Editor *Iron Trade Review*.

1. **In your opinion, will the general introduction of the pig iron warrant system into this country prove beneficial to the iron trade?**
2. **If so, why?**
3. **If not, why?**

The subjoined replies are given just as received, none being omitted, whether for or against. As nearly as possible, they have been classified, but in some cases concerns are enumerated under the head of "blast furnaces" that have also rolling mills. A summary of these opinions will be found in our editorial columns:

BLAST FURNACES.

E. J. Bird, Jr., President and Treasurer Ironton Furnace Co., Ironton, O.: In my opinion, it will prove beneficial. Concerns that must realize, necessarily rush their product on the market at times; and to realize quick must sometimes cut prices. A stock in storage yard would also prevent any great fluctuation in prices; also establish more uniformity in grading.

George Ruddle, Treasurer Carbon Iron & Pipe Co. Line, Mauch Chunk, Pa.: No. I do not consider it of advantage to legitmate trade to do anything to encourage gambling in iron—and that is about all that the warrant system is good for.

Alonzo Loring, Secretary Penwood Iron Works, Wheeling, W. Va.: We have not formed any opinion on the subject.

Hecla Iron & Mining Co., Ironton, O.: No. Would require too lengthy response to express the many objections. The experience in England and Scotland ought to be sufficient.

The Mahoning Valley Iron Co., Youngstown, O.: No. Because it would add increased cost, which some one would have to pay.

J. G. Butler, General Manager of the Brier Hill Iron & Coal Co., Youngstown, O.: No. Consider it a standing menance to the business and a useless expense.

Ed McAleer, Founder, Claire Furnace Co., Limited, Sharpsville, Pa.: I think not. It would cause frequent wide fluctuations in prices, with many depressions in the trade from large accumulations of stocks, which would be suddenly thrown upon the market at intervals, unsettling values. Gambling is not legitimate trade.

V. K. Moon, Iron Star Furnace Co., Detroit, Mich.: No. Because of its speculative features, and the "bulling" and "bearing" the market—market should rest on demand and supply, and speculation be eliminated.

Wm. Lauder, Pittsburgh: No. Will put market in control of speculators.

Duncannon Iron Co., Duncannon, Pa.: No. Because it enables makers to overproduce, and when the tight times comes, this stock is thrown upon the market and demoralizes it.

S. A. Fuller, General Manager Union Rolling Mill Co., Cleveland: It would be likely to induce accumulations of iron in dull times, when "blowing out" would be better policy.

Andrews & Hitchcock, Youngstown, O.: A delusion and snare to poor furnacemen.

Charlotte Furnace Co., Limited, Pittsburgh, Pa.: No. Because it is not generally entered into by large firms, and does not directly furnish capital to assist small furnaces to carry on operations.

Detroit Iron Furnace Co., Detroit, Mich.: No. It would encourage speculation.

W. F. Mattes, General Manager West Superior Iron & Steel Co., West Superior, Wis.: No. Because the tendency will be to encourage a speculative over-production, which is as demoralizing in the pig iron trade as in any other.

C. S. Kauffman, General Manager Columbia Iron Co., Columbia, Pa.: If manufacturers cannot find a market or cannot afford to sell at the market price, they had better stop making iron.

Chickies Iron Co., Chickies, Pa.: No. Because it is simply an inducement to keep on producing in excess of the demand, and stocks accumulated in this way are a menance to the market.

E. A. Wheeler, Manager Wheeler Furnace Co., Sharon, Pa.: It will not. Because it is only used by weak companies that are ready to grasp at a straw. The warrant system in Europe is a menance to the business, and will be here.

S. Frank Eagle, Youngstown, O.: It brings the manufacture of pig iron into the realm of speculation and it would create the strongest competitor the furnacemen could possibly have.

Jerome D. Boyer, Superintendent Chestnut Hill Iron Ore Co., Reading, Pa.: I don't think so. Because no benefit can come to any industry which needs assistance and which in the end is empty and fictitious. The laws of supply and demand, in a business so extensive and diversified as iron, will be regulated in its own way, not as miserable man may wish it.

W. H. Lee, President Midland Blast Furnace Co., St. Louis, Mo.: We think not. We think the effect must be to accumulate large stocks, a constant menance to the trade, which will prevent the increased price following those active calls for pig iron, which have for years been the only salvation of the pig iron trade.

A prominent Michigan furnace manager: No. It will introduce speculation to a greater extent, and, in case of overproduction, force lower prices; and at time of short supply, raise the market to an unwarranted price. Over production is always more liable to be than the opposite, a short supply.

G. N. Johnson, New Castle, Pa.: Have not given the matter any consideration.

Joseph E. Thropp, Proprietor Everett Furnace Co., Everett, Pa.: No. The manufacture of pig iron is a legitimate business of great magnitude. Much capital and many risks are involved. There should be no gambling schemes connected with it.

Joseph C. Kent, Superintendent Andover Iron Co., Phillipsburg, N. J.: I have had no experience with the system and have not been able to discern in it any advantage to the iron trade in this country.

Clifton Iron Co., Ironaton, Ala.: Having no connection with the warrant system, and not expecting to, have not given matter thought enough to express an opinion.

Beaver Marsh Co., Union Furnace, Winfield, Pa.: We are opposed to it.

George W. Harrison, Treasurer E. & G. Brooke Iron Co., Birdsboro, Pa.: We have never had occasion to test the system and know very little about it, but think there is so little margin on iron now, the makers would not be warranted to have this additional expense.

A. T. & J. J. Hamilton, Proprietors Etna Furnace Co., Etna, Pa.: Yes. It gives a steadiness to market; regulates to a certain extent an overproduction; gives a wider field to successful operation of blast furnaces; puts iron on an equal with other products of skill and labor.

Bonebrake, Burkhart & Co., Chambersburg, Pa.: As we have had no dealings, nor know of any party in our section that had, in the storage system, we have no opinion to express.

Graham & Robinson, Cedar Run Furnace, Graham's Forge, Wythe Co., Va.: We do not know anything about such matters. What we want is fair business and steady demand.

Thos. Seddon, President Sloss Iron & Steel Co., Birmingham, Ala.: Yes. Because it will furnish a sure and safe collateral on which to carry stocks of iron through periods of depression, and tend to prevent violent fluctuations in price, which is the bane of all manufacturing.

W. J. Taylor & Co., Chester Furnace, Chester, N. J.: No. 1st, because the manufacture of pig iron is scattered over too great an area of country; and 2d, users of pig are accustomed to buying, direct from the makers, brands that they are accustomed to.

Chas. A. McNair, Secretary Missouri Furnace Co., St. Louis, Mo.: Replying to your postal in regard to the pig iron warrant system, I answer: No. Because it encourages furnaces to run when they have no demand for their product, and accumulates stocks in the hands of speculators at low prices, so that legitimate trade between producer and consumer is perpetually menanced; add to this the duplication of stocks by "short" sales, and we have always an overstocked market and no margin of profit possible, either to the producers of ore and coke, the manufacturers, or consumers of pig iron.

R. H. McConaughy, Bass Furnace Co., Rock Run, Ala.: We make no pig iron for the market, and, in consequence, are not posted as to the effect of the warrant system.

McCormick & Co., Harrisburg, Pa.: Yes. It tends to secure sta-

bility in market prices. The system should enable producers (in case of sudden decrease in consumption) to sustain prices by storage of iron, and keeping out of a glutted market until prepared to take it.

Lehigh Iron Co., Allentown, Pa.: It is calculated to increase production beyond requirements for current consumption. The resulting accumulation is liable to depress the market. The fluctuations in price of warrant iron is liable to occur from causes which might not otherwise effect current market prices. This would injure the trade.

The Eliza Iron Co., Wellston, O.: No. Stocks should not be artificially accumulated. The greater the surplus, the lower the price. The less the speculator has to with a business, the better for the business.

F. B. Richards, Manager Buena Vista Iron Co., Buena Vista, Va.: No. The control of prices, instead of being regulated by demand, would, in this country, be in the hands of persons whose business is "dealing in margins."

J. F. Darnall, President: I believe the warrants would generally go into the hands of speculators, many of whom know nothing about the iron business, and always ready to unload when they ought to hold; consequently, tend to demoralization of the trade.

E. S. Noble, Secretary and Treasurer Elk Rapids Iron Co., Elk Rapids, Mich.: We do not. Because it exposes the pig iron business to the same objectionable speculative features which have proved disastrous to other industries.

Richard L. Coleman, President, Birmingham, Ala.: Yes. Mainly because it will enable many furnaces to hold their iron in stock, instead of dumping it on a weak market at ruinous prices.

Chas. E. Coffin, Muirkirk Furnace, Md.: We do not think that the warrant system is advisable, because it will cause a speculative dealing that will be sure to injure the trade.

R. Sayers, Cave Hill Furnace, Wytheville, Va.: Yes. Because I think it would enable the weak manufacturer to tide over stringency in the money market without sacrificing his product.

Edward A. Low, Treasurer Low Moor Iron Co., of Virginia.: No. There is too much difference in the quality of iron made in different sections of the country. Consumers here will not buy warrants for iron stored in Virginia or Alabama.

A manager of a furnace in Jackson, O., writes: No. Because we understand the experience of Great Britain to be against it. Of what use is experience or history if we are not guided by it?

J. M. Thomas: No. Do not think it will be beneficial to the iron trade or to any other legitimate trade. It will only afford means of livelihood for a set of gamblers who endeavor to get through the world by means of their wit. Have no use for them.

W. H. Hinkle, Secretary Ashford Iron & Steel Co., Minneapolis, Minn: We believe this company was organized for the purpose of speculation in pig iron, and, therefore, it would not be beneficial to the iron trade. Considering its effect upon other products, we do not see how it could prove otherwise than disastrous to the iron trade.

T. J. O'Brien, President Antrim Iron Co., Grand Rapids, Mich.: A year or so ago the subject of the storage warrant system was brought to my notice, and, in fact, we were urged to make use of it. The plan, as I recall it, involved some practical difficulties, which would seem to make it not easy to carry on its affairs with any sort of independence. I gave an adverse reply then, and I have not seen cause to change it since. When a furnace shall be so hard pressed as to need this sort of aid, it will generally be found that there is an over-production of iron, and the carrying of an increased amount through the aid of this system, will simply add to the difficulty and make greater the catastrophe which sooner or later must follow.

ROLLING MILLS AND STEEL WORKS.

E. Gybbon Spilsbury, Managing Director Trenton Iron Co., Trenton, N. J.: Haven't given the matter any consideration, not being interested in it.

Aetna Nut Co., Southington, Conn.: We are not interested in this line. Our business does not call for that class of goods.

Wm. L. Bailey, Treasurer Thorndale Iron Works, Thorndale, Pa.: I really know nothing about it; practically, though, it seems plausible and likely to insure a more regular price—as in case of a weak market the holder would not be compelled to sacrifice in order to secure sales, from other than his regular customers; and even if compelled to stop his furnace, the iron could be gradually, instead of suddenly, sold.

J. H. Sternbergh & Son, Reading, Pa.: We are not prepared to express an opinion.

Wm. H. Baldwin, Secretary Youngstown Iron & Steel Co., Youngstown, O.: We don't make pig iron, and have no remarks to make.

LaBelle Iron Works, Wheeling, W. Va.: Answering your circular of November 26, 1890. We are not directly interested in the subject; have not given it much attention, consequently do not care to make any expressions on same.

Smith Bros. & Co., LaBelle Steel Works, Pittsburgh, Pa.: We prefer not to express any opinion.

Falcon Iron & Nail Co., Niles, O.: No. Because we think it will create, naturally, speculation, which is always injurious to legitimate business.

A. M. Byers, of A. M. Byers & Co., Pittsburgh, Pa.: Cannot see any benefit to come out of it. The warrant system in my opinion is unnecessary to the legitimate business of manufacturing and selling pig iron.

Aetna Iron Works, per J. Louis Pfau, Jr., Secretary, Chicago, Ill.: No. Yes. It will benefit furnacemen by enabling them to run their furnaces continually and produce more iron—which will more than offset the interest charges. It will invite and bring overproduction. It is a question to be determined by experience, if speculation in iron warrants will hold up prices in the face of overproduction.

United States Iron & Tinplate Co., Limited, Demmler, Pa.: We have not given the matter sufficient attention to be conclusive in our opinion, but we fear the introduction of this system will bring the pig metal business too much into the hands of speculators, and the consequent frequent fluctuations will seriously bother the actual consumers.

Jno. C. Porter, Secretary Spang Steel & Iron Co., Limited, Pittsburgh, Pa.: In my judgment, I do not believe that it would be to the interest of either the maker or consumer of pig iron.

Cleveland Hardware Co., C. E. Adams, Treasurer, Cleveland: We do not use pig iron, so our knowledge would not be worth anything to you.

Frankford Steel Co., Philadelphia, Pa.: We are not in the line of business having to do with pig iron, and therefore have given the matter no thought.

Norristown Iron Works, James Hooven, proprietor, Norristown, Pa.: I am not interested in the question inquired about, as I have leased my blast furnace, and really can give no opinion upon the subject.

Charles Burgess, proprietor Cyclops Steel Works, Titusville, Pa.: Have not given the subject any great amount of consideration.

Jenkins Bros. & Lingle, Howard Rolling Mills, Bellefonte, Pa.: We cannot see in what respect it would be of benefit.

Marshall Iron Co., Newport, Del.: We do not favor the project, our interest and preference is to deal direct with the producer, thereby getting more satisfaction in what we want, and settlement of claims for defective iron.

W. W. Kurtz & Sons, Coatesville, Pa.: We have not given the subject any consideration whatever, and are therefore unable to express an opinion.

From a leading iron company in Columbus, O.: No. Because it encourages furnaces to run even at a loss, when without the warrant system they would probably blow out, and wait for a better market.

Diamond State Iron Co., Wilmington, Del.: No. We think it will stimulate overproduction, and invite speculators to ruin the general market and iron industries to considerable extent.

Pompton Steel & Iron Co., Pompton, N. J.: It will [be beneficial] to the buyer, because it will encourage overproduction with the inevitable result.

Harvey Steel Co., Newark, N. J.: Don't know. Do not use pig iron.

Ohio Falls Iron Works, New Albany, Ind.: We think not. Think will get up speculation, instead of leaving trade where it ought to be, viz.: between consumer and producer.

T. C. Jones, General Manager Iron Gate Iron & Steel Co., Iron Gate, Va.: If the amount of warrants issued do not exceed 75 per cent. of the actual value of pig iron upon which they are issued or represent, I think the system will prove beneficial to producers and consumers.

A. W. Train, Manager Fort Payne Rolling Mill, Fort Payne, Ala.: Yes. It will tend to keep weak concerns from forcing their product on the market, and demoralizing the business generally.

American Sheet Iron Co., Geo. Danby, Treasurer, Phillipsburgh, N. J.: No. 1. It would cause overproduction. 2. Speculation. 3. Violent changes in prices.

James Millar, Treasurer Robinson Iron Co., Plymouth, Mass.: Would probably lead to further speculation, and consequent injury to legitimate trade.

Haxtun Steam Heater Co., per A. M. Howlett, Assistant Treasurer, Kewanee, Ill.: We have not given this matter sufficient thought and investigation to make our opinion of any value.

Indianapolis Rolling Mill Co.: We are out of the iron business, therefore have given the matter no thought or attention.

Elmira Rolling Mill Co., Elmira, N. Y.: We are so much in doubt as to the outcome of the system, that we are not prepared to express any opinion.

Van Alen & Co., Northumberland Iron & Nail Works, Northumber-

land, Pa.: We think it will not. It often leads to fictitious or speculative values.

H. L. Sholly, Superintendent Tyrone Iron Co., Tyrone Pa.: We regret to say we have not given the subject of pig iron storage any particular thought pro or con. We are not manufacturers of pig, and really not direct consumers.

Joseph Corns, of J. Corns & Son, Massillon Rolling Mill, Massillon, O.: In answer to yours 26th, will say that I am not sure that the subject if fully understood by me. If it is a place where a party can store a lot of iron and receive a stipulated sum of money on it, and the party advancing the money may sell at a price fixed by the maker of the iron—if that is correct, why, I can see no objection to it. The only difference between that and a bank, as I see it, is, that the storage company might loan its money on that kind of security when a bank would not; and again, the storage company would have the iron in its possession under its own lock and key, while the bank could not, so that a bird in the hand might be worth two in the bush. It is very convenient sometimes to borrow money in that way; but if it is for all parties to place their product in bond and let all the iron be sold by the storage company, and to pay what the iron nets when all expenses are paid, I cannot see how that can be called a good thing for the makers of iron of any kind. The first named plan must be viewed as a pond for what may be called lame ducks, and the last named might be called a pond for ducks to become lame; for the good reason that to pay transportation, and loading and unloading twice in addition to the commissions to be paid the storage company, it seems to me, that business can not be prosperous if done in that way for any great length of time. The man having a good location, good management, and money enough do his business does not need those helpers, and the chances are that this man, if he connects himself with the storage company, will be contributing to his neighbors, who are lacking in some or all of the advantages above named, and who will be likely to pull himself down to a lower level, with no likelihood of lifting the other fellow up.

The Midvale Steel Co., Chas. Harrah, President, Philadelphia, Pa.: I beg leave to acknowledge receipt of your favor of 26th ult., and would say that I have no views at all to express on the subject matter to which you call my attention. When I am in the market for pig iron, I find no difficulty whatever in getting all I want in my immediate neighborhood.

The Otis Steel Co., Limited, Cleveland, O.: We have no experience in this matter, but can see no objection to the system.

J. M. Whittemore, Colonel of Ordnance, commanding Rock Island Arsenal, Rock Island, Ill.: My duties here have been such that I have had no occasion to look into this subject, and can therefore express no opinion.

The Manager of the Dover Iron Works, Dover, N. J., writes: 1. Because a large supply of pig on hand will be a wet blanket on the market. 2. It will lead to gambling in pig iron warrants by parties outside the trade.

C. L. Bailey, President Central Iron Works, Harrisburg, Pa.: No. We believe that a general introduction of the warrant system into this country would lead to increased speculation in pig iron, which would be injurious to legitimate business, and more than counteract any possible advantages arising from the use of the system.

Columbia Iron & Steel Co., E. M. Butz, Manager, Allegheny, Pa.: No. Because the business is not legitimate, and affords irresponsible parties opportunities to buy and sell that which they don't own, and the whole fabric of such system assuredly favors commercial demoralization.

Thames Iron Works, James Greenwood, Secretary, Norwich, Conn.: Having no use for pig iron, no knowledge of the trade or workings of it, we have no opinion to give worth while.

W. H. Powell, late President and General Manager, Western Nail Co., Belleville, Ill.: I think not. Years of experience teaches me that any and all devices to combine interests in same lines, to regulate product and maintain values, may be used for temporary relief, but will most assuredly induce overproduction, sharpen competition and result ruinously to manuufactuers. Close margins will prevent overproducing, and a steadier and healthier condition in all the lines of our great manufacturing industries.

R. Bentley, General Manager Ohio Iron & Steel Co., Youngstown, O.: I do not. See reasons given your editor some time ago. [The article in question appeared in *The Iron Trade Review* of February 21, 1889, and is herewith reproduced:

I do not believe the establishment of such a storage warrant company would be for the best interests of the pig iron manufacturers of this section. Viewed from the standpoint of a banker or money-lender, it is easy to see why so many strong and influential stockholders have given their names to the enterprise. All the advantages of the scheme are in their favor, and if they can find people enough to put up iron and borrow money, they will be successful, as under their prospectus they simply take iron into their keeping and issue a warrant, for which the producer is obliged to pay. The furnace companies in our vicinity have no trouble whatever in borrowing what money is necessary to carry accumulated stocks without going to the expense of paying an arbitrary storage and carrying charge, outside of the interest, for the privilege of so doing. We can easily see how it would be a temporary advantage for furnace companies whose financial condition is weak, as it would enable them to keep their plants in operation and pile up iron, with a hope that a rise in the market eventually would let them out. The argument used by the promoters of the scheme, that an accumulation of stocks to the amount of 1,000,000 or 2,000,000 of tons would be a safeguard against great fluctuations in the market, is very deceiving in its import. Every legitimate manufacturer knows that when the stocks of iron in the country increase, it is always the occasion of low prices, and a great argument used by the buyer to keep prices down. We had a most forcible example of this in the large amount of Marshall iron that some years ago was put in the storage company's hands in the city of Pittsburgh. Storage certificates were issued on this iron on which the banks loaned money. It had a depressing effect on the market, for whenever a quotation was made on iron some one who had loaned money on the certificates, and was tired of carrying it, would sell it at a sacrifice. The banks were the only ones who were benefited by the movement, and to the manufacturer it was "a thorn in the flesh" until it was all sold. We do not see how it is possible for any well organized and sound financial concern, who expected at all times to pay 100 cents on the dollar, and to give their stockholders a reasonable interest on their investment, to pay a storage charge and encourage a scheme that will ever be a wet blanket upon the trade. The large productive pig iron capacity of this country, as it now stands, will prevent any great fluctuations in the price of this commodity, and we believe the best way to bring about an improvement in the market is to curtail production rather than to adopt any measure whereby inducements are offered to produce something that is not wanted. In conversation with many of the prominent iron manufacturers of the Mahoning Valley, it is the general sentiment that the success of the warrant company would seriously impair business here.

AN OHIO COMPANY'S GREAT BUSINESS.

The firm of James Leffel & Co., Springfield, O., is one of the most widely known institutions in our State. The trade on their old reliable and justly celebrated James Leffel turbine water wheel extends all over the civilized world, and they are now pushing with special vigor the manufacture and sale of their horizontal center crank engines, with self-contained return tubular boilers; also, a splendid line of improved upright engines, together with submerged tubular steel boilers. They have successfully introduced about 12,000 of their turbine wheels, and over 4,000 of their engines and boilers, and their well earned and firmly established reputation for supplying goods of merit and fair and honorable dealings is well deserved and sure to be maintained. Their trade the present season has been far in excess of last season, and the prospects for the future are very flattering. This may be largely attributed to the wide-awake spirit of progressiveness that pervades the firm, their motto being "to lead and let those who can follow." We mention the following as being among their recent wheel shipments: Six of their wheels, aggregating shipment weighing over 120,000 pounds, to furnish power for the State Institution of Folsom, Cal.; new style double discharge mining wheel, for use in one of the largest mines at Anaconda, Mont.; new design and new style double discharge 30½-inch wheel, to Rochester, N. Y.; special twin 30¼ inch wheel, to Rochester, N. Y.; a 7-inch special, one of the largest wheels made, to Oregon, Ill.; two new double discharge 20-inch wheels, to Baltimore, Md. Their engine shipments have gone to all portions of the United States, and quite a number to Mexico, Cuba and South Africa. Their present shops were designed, built and arranged with special machinery for their work, and their large stock of patterns of wood and iron, with the new ones constantly being designed and made, afford them every facility necessary for manufacturing their special lines in the promptest manner and with the latest and best improvements.

BOILER COMPOUNDS.

The question of boiler compounds has been discussed the world over; the respective merits of the various brands and kinds are daily before the notice of engineers and their employers. It is a leading question with every one connected, no matter in what capacity, with a steam plant, as to which brand possesses the most real, economical and practical value. The superiority of Lord's boiler compound is so well known amongst engineers as to need no elaborate literary article to herald its merits, and we quote an abstract from Roper's "Care and Management of the Steam Boiler," on page 118, as follows:

MECHANICAL BOILER CLEANERS.—The benefits derived from mechanical devices are limited to earthy matter only. The acids that cause pitting, honeycombing, grooving, etc, held in solution, are beyond the reach of any mechanical device, and can only be combated by a chemical combination such as Lord's boiler compound."

Then, again, in Roper's "Handy Book," page 465:

"Lords boiler compound appears to be the only chemical preparation in use at the present times, that will prevent the formation of scale, or remove it after it has been formed in any class of boilers, whether stationary, locomotive or marine, as it neutralizes the action of the chemical salts which form the basis of all scale and incrustation."

Every intelligent and advanced engineer knows the saving of a compound, such as Lord's affords, not only to the engineer, but employers as well, chief amongst which are the saving of fuel, repairs and explosions.

CLEVELAND AND THE CENTRAL WEST.

Within the past decade, the population of Cleveland has increased from 160,140 to 261,546, the city rising from eleventh to tenth place. The increase from 1870 to 1880 was 72 per cent.; that from 1880 to 1890, 63 per cent. During the same period, the number of manufacturing establishments of all kinds has increased fully 100 per cent. In all that goes to make up a great and growing city, Cleveland is making prodigious advances. The latest available figures (1889) show that there were then in Cleveland 1,398 manufacturing establishments (the more comprehensive work of the census brings this up to nearly 2,500) with an aggregate capital invested of $32,030,863, an army of 36,249 persons employed, to whom are paid in wages $15,564,096, working up $46,457,286 worth of materials, and turning out a product valued at $83,107,435. Every variety of manufactured product is turned out—air compressors, agricultural implements, boilers, boots and shoes, brooms, bridges, cloaks, corks, chewing gum, cutlery, egg cases, electrical instruments, iron and steel, linseed oil, nuts, bolts and washers, pumps, safes and locks, stoves, steel screws, ships, printing presses, etc. The detailed figures for 1889 are worth preservation, and are submitted below, not as absolute, but as comparative:

Industries.	No. of establishments.	Capital invested.	Average number of hands employed.	Total amount paid in wages during the year.	Value of materials.	Value of products.
Air compressor manufacturing	2	$ 29,100	22	$ 7,100	$ 91,300	$ 101,600
Agricultural implement mfg	4	161,100	71	18,427	67 410	99,870
Architectural iron works	6	89,400	133	58,200	104,700	193,800
Awnings and tents	2	19,000	38	11,100	27 000	36,500
Baking powder manufacturing	2	37,000	30	9,400	67 000	92,000
Basket manufacturing	8	41,400	97	39,300	42,100	97,900
Boiler works	7	495,000	944	1,149,860	1,491,278	2,992,457
Book binderies	14	134,000	248	72,100	136,100	241.100
Boots and shoes	18	417,400	527	190,143	393 582	795 890
Bottling works	17	27,000	94	17.400	33,400	69,300
Box manufacturing	11	23,750	247	72 800	98,100	265,700
Brass foundries	12	104,800	293	145,037	315.470	1,010,500
Bread and other bakery products	19	47,000	200	60,000	345,000	485,000
Breweries	20	2,110,000	387	245,875	1,205,600	2,974,000
Brick and tile	35	138 400	364	107,100	59,825	276.700
Bridge works	3	308,000	493	165,350	420,510	795,110
Bronze works	2	2,750	25	4,375	1,150	6,970
Broom manufacturing	10	35,800	119	69,785	73,200	175,110
Brush manufacturing	11	41,000	320	84,200	89,150	216,100
Can manufacturing	2	18,900	82	39,600	29,450	109,850
Carpet cleaning works	7	29 500	58	14,850	3,050	52,810
Carriages and wagons	48	295,300	518	211.470	204,375	609,070
Chain manufacturing	2	19.000	30	17,240	21 385	42,000
Cheese factories	20	27,800	46	7,490	91,120	119,400
Chewing gum manufacturing	4	19,300	152	27,600	22,960	61,875
Cigars and tobacco	258	543,206	1,567	295,000	769,900	1,194,500
Cloak manufacturing	16	1, 00,000	1.412	43 ,800	2,783,000	3,972,000
Clothing (men's)	80	1.121 400	2,475	667,410	1,509,940	2 944,417
Coffee and spice mills	7	204,650	99	49,320	314,780	510,000
Confectioneries	78	134,410	150	47,920	246,700	321,300
Cooperage	13	46,890	217	92,480	344,820	486,450
Cork manufacturing	2	3.500	15	4,620	5 890	12,200
Cornice works	3	29,500	21	13,970	41 325	65,720
Corset manufacturing	5	6,500	25	5,800	9,750	21,280
Cutlery and edge tools	4	108 750	133	56,531	62,427	131,800
Distillery	1	36 400	17	43,870	46,890	98 985
Drill manufacturing	4	70,000	31	42,080	91,950	147,850
Drugs, chemicals and compounds	10	685,400	252	97,670	372,950	605,450
Dye works	6	7,400	14	4,710	5,450	12,980
Egg case manufacturing	2	7,400	30	12,890	16,450	30,800
Electric lights	2	385,000	310	157,800	194,800	570,000
Electric instruments	4	24,400	17	13,850	27,910	46,890
Fertilizer manufacturing	4	194,600	77	28,425	143,000	269 325
Flavoring extracts	2	21,000	36	12,890	36,850	59,480
Flour mill machine manufacturing	2	36,400	27	19,980	44,810	73 890
Flour mills	36	492,000	160	61,470	2,410,890	2,963 425
Foundries and machine shops	64	1,402,300	2,899	1,021,180	1,997 890	4,690,160
Furniture manufacturing	33	608 600	1 638	252,145	264,916	622,915
Fishing tackle manufacturing	5	115,000	210	53,000	75,000	156,000
Galvanizing works	2	40,400	31	21,210	47,900	72,480
Gas fixtures	2	15,125	12	8,320	29,800	44,890
Hat and cap manufacturing	6	45,500	63	9,870	61,750	94,980
Hosiery manufacturing	2	11,600	90	14,430	27,200	71,460
Hot air furnaces	2	43,500	30	22,800	63,389	101,347
Iron and steel	8	2,196,000	4,598	2,211,857	6,183,445	9,587,453
Iron fence and board mfg	3	84,900	131	62,000	238,270	324,830
Jewelry	3	4,840	28	11,825	10,450	24,370
Lamp and reflectors	3	224,000	174	61,450	26,890	98,940
Laundries	40	79,800	246	56,910	17.425	133,400
Linseed oil manufacturing	6	327,000	63	41,250	485,220	556,920
Lumber dealers	36	986,000	1,857	400,840	1,610,840	2,176,300
Marble and stone works	19	211,756	252	121,240	247.410	479,670
Mattress and spring bed mfg	8	126,900	72	25,250	96,300	140,100
Musical instrument manufacturing	3	42,400	41	22,300	15,700	44 680
Novelty works	3	156,000	187	79,470	241 400	378,340
Nuts, bolts, washers and rivets	5	510,000	444	211 300	906,600	1.148,900
Oil works	16	4,255,000	2,390	944,750	4,798,000	12.255,000
Paints and varnishes	12	511,900	333	161.137	897 900	1.301,370
Paper mills	4	519 000	296	103,133	453,710	588,312
Pattern works	2	11.800	28	19,220	22,195	44,210
Picture frames	3	85,900	79	43,480	64,390	118 530
Plumbing	38	300,500	190	144,740	483,700	658,800
Polishing and plating works	4	21.400	45	17,420	16,470	44,780
Pork packing	2	111 500	78	42,800	1,226,940	1,987,650
Powder manufacturing	2	155,000	89	38,600	435,465	547,920
Printing offices	32	1,021.000	859	567,890	559,839	1,313 437
Pump manufacturing	7	22,300	27	14 820	13,400	31,672
Refineries	4	4,610,400	612	382,200	2,912,470	4,176,450
Roofing materials	3	62,500	47	21,780	117,400	164,530
Saddlery hardware	13	39 500	30	16.700	42.300	63.970
Saddlery and harness	39	38,650	102	32,940	68,430	129.420
Safe and lock manufacturing	2	75,550	62	51,480	197,890	285 970
Sash weights	2	9,500	20	9 980	17.000	34,810
Saw manufacturing	2	65,500	50	21,813	33,480	57,910
Sewer gas trap manufacturing	2	65 000	43	26,890	74,800	108,830
Sewer pipe manufacturing	2	58,500	41	21,930	49,310	80,450
Sewing machine and needles mfg	6	1,184,150	1,034	624,230	706,500	1,424,580
Shirt manufacturing	6	18,250	70	13,387	49 410	84.440
Shipbuilding	8	195,000	270	139,365	297,890	513,300
Show case manufacturing	2	17,500	48	22,325	36,550	67,430
Soap manufacturing	7	29.400	31	10,321	53,418	76.350
Steel and brass wire	4	981,800	829	497,850	1,052,490	1,952,800
Step ladder manufacturing	3	6,400	26	12,390	8,212	25,715
Stove foundries	14	580,000	417	291,800	197,400	526,412
Tanneries	8	175,000	95	72,400	220,000	327,400
Tinware manufacturing	3	33,800	88	52,800	71,920	140 530
Trunks, etc., manufacturing	2	76,400	93	49,810	77,950	138,400
Umbrella manufacturing	6	13,700	23	7,490	17,860	29.450
Upholstering	13	13,800	39	17,815	62,740	103,412
Wash board manufacturing	3	107,006	157	85,490	209,470	359 450
Wheelbarrow manufacturing	2	3 800	21	11,820	12,920	31,240
Wire manufacturing	2	571 500	1,548	743,850	1,156,600	2,735,040
Wringer manufacturing	2	7,400	27	11,460	13,580	28,812
Yeast manufacturing	2	4,600	12	4,600	5,100	13,125
*Miscellaneous	36	1,402,720	1,183	501,595	2,032,825	2,973,079
Totals	1,398	$32,030,863	36,249	$15,5 4,096	$16,457,286	$83,107,435

*Artificial flowers manufacturing, bellows manufacturing, billiard table manufacturing, brewer's supplies, brick manufacturing, carbon manufacturing, car manufacturing, cartridge manufacturing, coffin manufacturing, door knob manufacturing, engraving manufacturing, faucet and bungs manufacturing, flour sack manufacturing, frog and crossing manufacturing, fur manufacturing, glass works, heater manufacturing, ice machine manufacturing, ink manufacturing, jelly manufacturing, lard refining, lead pipe manufacturing, lime manufacturing, malleable works, naptha manufacturing, pail manufacturing, phosphate manufacturing, pipe manufacturing, printing ink manufacturing, quilting works, scale works, screw works, shoddy works, target manufacturing, vapor stove manufacturing, woolen mill.

Cleveland supplies the Union with the largest cable machinery, directs the petroleum industry of the world, sets the patterns for all the steel plate mills of the country, makes the largest forgings, was the first to utilize Bessemer steel in making screws, furnishes the machinery for handling the mountains of coal and iron ore annually transported on our lakes, and exceeds all other lake ports in the number, size and seaworthy qualities of her new tonnage. During the past five years, Cleveland shipyards have turned out more than 50 magnificent steamships and water craft, with an aggregate tonnage of more than 100,000, and valued at over $8,000,000. More lake tonnage is owned in Cleveland than in any other port. Cleveland is second only to New York in the amount of tonnage inspected by the United States Inspector General the present year.

THE GREAT STATES BORDERING ON THE CHAIN OF LAKES.

If we broaden our outlook, and take in the eight great States bordering on the chain of lakes, we are amazed at the magnitude of the interests involved. The aggregate population of the States of New York, Pennsylvania, Ohio, Indiana, Illinois, Michigan, Wisconsin and Minnesota is 25,978,299, or 40 per cent. of the population of the entire country. Within these States are 68 cities having populations of 20,000 or more inhabitants. The aggregate population of these 68 cities is 8,500,040. Among the cities bordering on the lakes are Chicago, Milwaukee, Cleveland, Detroit, Erie, Duluth, Buffalo and Oswego, with a total population of 2,114,599. A territory unsurpassed in the wealth of its natural resources, as well as in fertility, and in area four times as great as the British Isles, and greater than all of France and Germany taken together, is naturally tributary to the lakes. More than one-fourth of the whole population of the nation is interested in the condition of lake commerce, and lake freight rates in a broad sense affect nearly the whole country, for the prices of iron and steel are directly influenced by them and by the conditions which make lake commerce active or dull. Within the decade, the carrying capacity of lake shipping has more than trebled, and the character of the vessels built on the lakes vastly improved. Ten years ago less than 1,000,000 tons of ore came down the lakes during the season; this year the total has gone above 8,000,000 tons. Then but little more than 1,000,000 tons of coal was carried up the lakes; this season there were shipped nearly 4,000,000 tons from the Lake Erie ports. The increase in the grain, flour and package freight business has been hardly less notable, and the whole unites in a record of development such as has rarely, if ever, been equaled in the history of commerce.

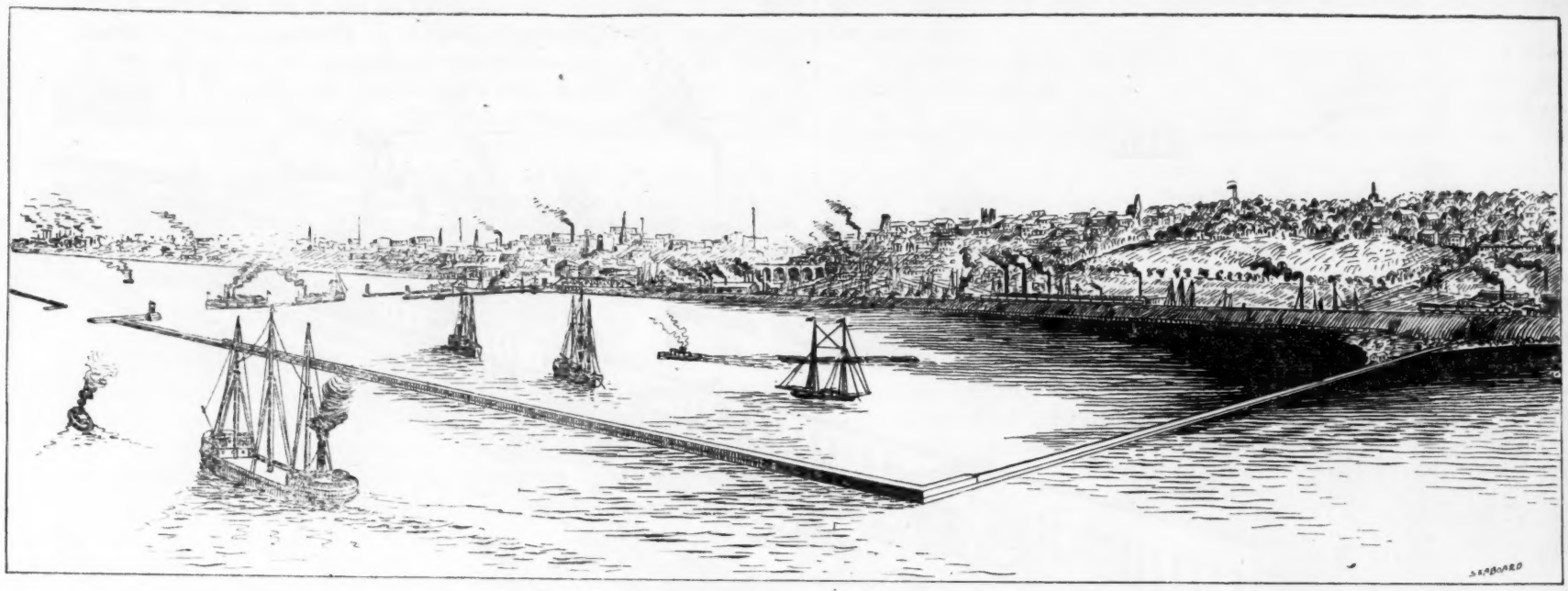
The great wheat fields of the Dakotas have been opened within the decade. Minnesota has increased her population by more than one-half and doubled her producing capacity. Wisconsin has done nearly or quite as well. Chicago has added more than 500,000 people to her population. Michigan, Indiana, Ohio and Western Pennsylvania and Western New York have all made fine gains, and their industrial development has much more than kept pace with the growth and population. The iron and steel interests which were great then are still more extensive now, and the filling up of the Northwest has greatly widened the market for the bituminous coals of Western Pennsylvania and Ohio. So it happens that the furnaces of Pittsburgh and the Mahoning Valley must have the Bessemer ores of the Lake Superior region, and Minnesota must have the coal of the lower lake region, and over the lakes is the cheapest route by which these great staples can reach their markets.

In the last three years, there have been launched ships with a total carrying capacity, in round numbers, of 316,000 tons. During the same period the ships built on the whole Atlantic and Gulf coasts only had a

tonnage of 332,000 tons. A much larger percentage of the lake than of ocean vessels was steam, however, and the greater rapidity with which ships are handled here than on the ocean doubtless fully made up for the difference. These newer lake vessels, more than one-third of which are iron and steel, make up a fleet that, in solidity, speed, general beauty and excellence, has few superiors among the merchant navies in the world. In 1890 the business fleet consisted of 2,055 vessels of 826,360 net registered tons, and of the value of $58,128,500. Of these vessels, 1,153 are steam, with a tonnage of 523,702 tons and a valuation of $48,434,350; 902 are sail, with a tonnage of 302,658 tons and a valuation of $9,694,150. Of the steamers, 232 are steamers of over 1,000 net registered tons, and 110 are steamers of over 1,500 net registered tons. It is interesting to note that during the past year the steam tonnage of the lakes has become greater than the steam tonnage of the entire Atlantic coast. The census of 1890 shows that there was carried on the great lakes during the season of 1889, 27,417,596 net tons of cargo, of which the following is a summary:

	Tons.		Tons.
Iron ore	7,650,455	Corn	1,929,613
Coal	6,080,697	Oats	413,222
Lumber	5,6 6,426	Barley	126,682
Shingles	161,861	Other grain	105,415
Lath	73,437	Salt	296,540
Flour	823,764	Pig iron	147,553
Wheat	960,144	Miscellaneous	2,960,789

Such, in brief, is the great Central West, of which Cleveland is an increasingly important factor.



GENERAL VIEW OF CLEVELAND HARBOR.

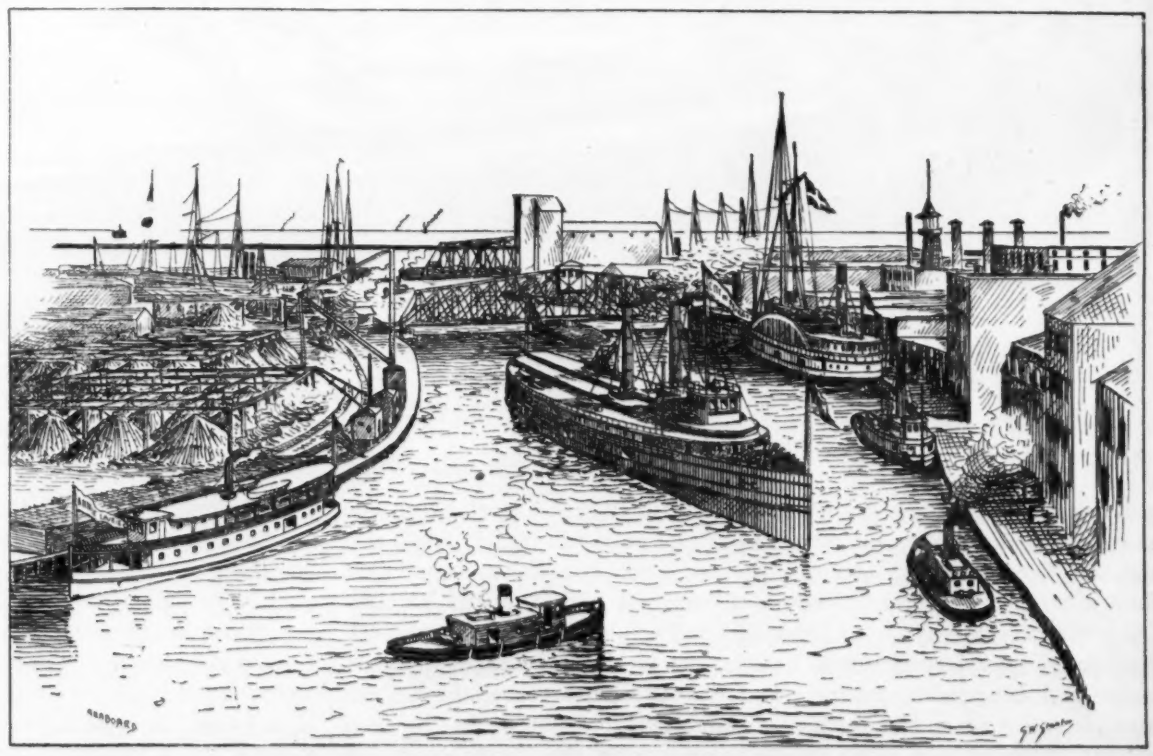
LEADING INDUSTRIES OF CLEVELAND.

THE UNION ROLLING MILL COMPANY.

The "Iron Ward" of Cleveland, as it continues to be familiarly called—notwithstanding the re-division of its territory into other wards, by the municipal authorities, is the Birmingham corner of the Forest City, long the chosen territory for the most extensive local manufacturing plants, enjoying what amounted to a virtual monopoly, in this direction, for many years. Here it was, in the old Newburgh suburb, that the beginning was made for that manufacturing eminence which is Cleveland's chief source of fame and substantial prosperity, and without which she could never have so far outstripped her municipal rivals on the lakes.

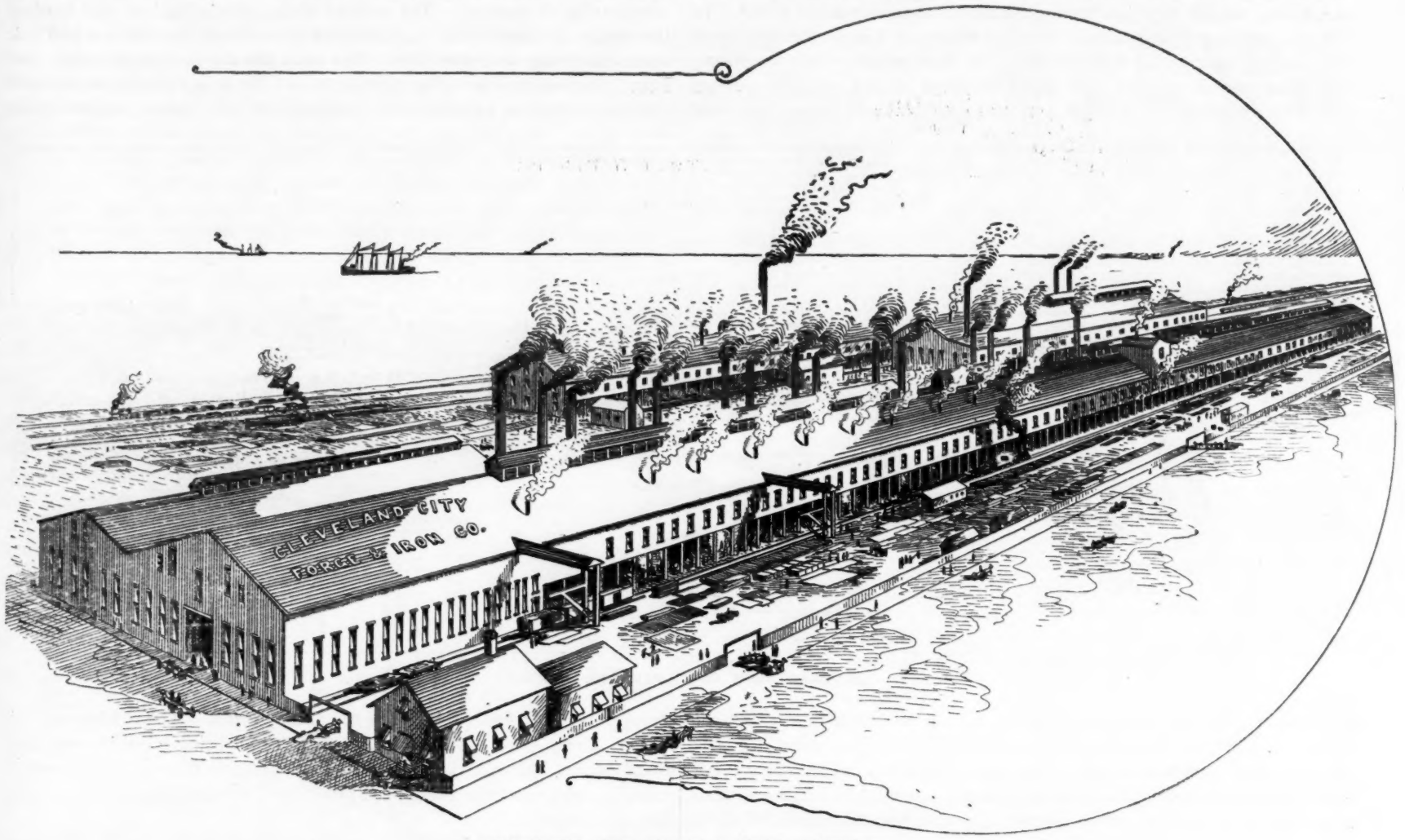
Prominent among the extensive manufacturing concerns in the section referred to, is the Union Rolling Mill, owned and operated by the Union Rolling Mill Co., of this city. It is situated in one of the most favorable locations in the heart of the manufacturing district, being directly upon the main lines of three railroads, the N. Y., P. & O., the C. & P., and the C. & C. The mills and furnaces cover some 20 acres of land, and are built with a view to the most rapid work that it is possible for a modern plant to turn out. They were formerly known as the mills of the Union Iron Works Co., and include a rolling mill and blast furnace, but since their purchase by the Union Rolling Mill Co. they have been greatly enlarged, modernized and improved in every way. The latest machinery has been added in each department, and the plant is now looked upon as thoroughly complete in all respects. The product of the mills is pig iron and finished bar iron, a specialty being made of finished merchant bar iron, nut and bolt iron, and bridge and rivet iron. The mills also turn out angle splices, and light T and street rails. The capacity of the works is about 60,000 tons of pig iron, and about 40,000 tons of finished bars per annum, and this gives employment to a force of between 500 and 600 men. The market for this output is very largely a local one, the bulk of it being taken by manufacturers within the city boundaries. The balance finds a market which extends throughout the nation, the products of the company having a widespread reputation.

The Union Rolling Mill Co. was organized in this city, in 1880, and is in its management a purely home corporation. The officers for the present year are S. W. Sessions, President; A. S. Upson, Vice-President; S. A. Fuller, General Manager and Treasurer; H. Arthur Fuller, Secretary. All of these gentlemen have had much experience in the manufacturing business, and bring to the direction of the company's affairs not only a thorough knowledge of the work in hand, but also the added benefits of high commercial standing. The President, Mr. S. W. Sessions, has long been known in connection with one of the most extensive manufacturing plants in the city; Mr. A. S. Upson, Vice-President, is also widely recognized as a prominent factor in local business circles; Mr. S. A. Fuller, the General Manager and Treasurer, has had an extensive experience in iron manufacturing, both in this city and in other localities. The Secretary, Mr. H. Arthur Fuller, attends to the business of the office. Backed by the



VIEW IN RIVER BED, CLEVELAND.

thorough business methods of these gentlemen, the Union Rolling Mill Co. has proved a highly successful corporation. Its mills, conducted on the most careful basis, have won for their product a deserved reputation throughout the country, insuring a market for them as fast as produced. Each year of its existence has shown a steady increase in the business of the company's mills, and the outlook for the future is prophetic of still further success. The general offices of the company are admirably located in the Perry-Payne Building.



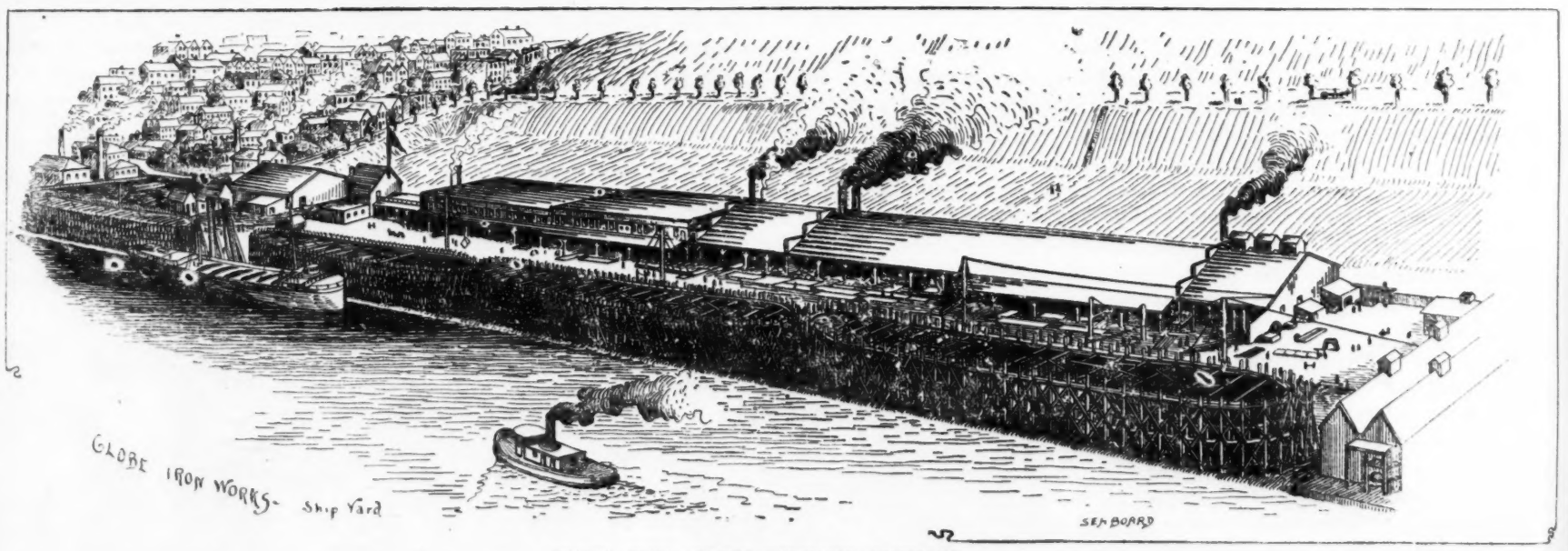
CLEVELAND CITY FORGE & IRON COMPANY.

THE GLOBE IRON WORKS COMPANY.

[ILLUSTRATED.]

The belief, which appears to have gained some foothold in the East, that the lake marine is gradually sinking into a condition of desuetude, will find no sympathizers in Cleveland. The intelligent Clevelander, who is at all posted regarding the industries of this port, will frankly admit that the lake fleets need subsidizing; but only such subsidies as come in the form of strengthened canals, deepened channels and improved harbors. Otherwise, as the intelligent Clevelander will emphatically tell the mistaken Eastern man, the lake marine is looking out for itself in an exceedingly active and independent manner; and he will add that when the Eastern man is hunting around for the nation's largest shipbuilding works, he need not expect to find them along the Delaware, nor on the Pacific coast, for just at present they are located here in Cleveland, with every prospect of a lengthened stay.

It is the Globe Iron Works Co., as every Clevelander has learned to know, which thus carries away the supremacy from the seaboard shipyards; the Globe Works, which puts a 3,000-ton steel steamship into the water every five weeks, and still finds no abatement in the demand for more!



GLOBE IRON WORKS COMPANY—SHIPYARD.

The present Globe Co. is the outgrowth of a partnership concern formed in 1853, and doing business under the name of the Globe Iron Works. In July, 1886, this became the incorporated Globe Iron Works Co., with a capital of $500,000, and all the facilities necessary to the fulfillment of the contracts which were crowding upon it. Since that reorganization of the original company, the Globe has built and launched 27 steel steamships, representing a value of $6,000,000, or an average of over $200,000 for each, and an aggregated tonnage of over 80,000. With the launching of the Matoa, on June 17, 1890, the annual record of every shipyard in the nation had been passed and the Globe was leading them all.

It may be interesting to note the names of the purchasers of the 27 boats built by the company, and the list is herewith given: three for the Mutual Transportation Co.; six for the Northern Steamship Co.; five for the Lehigh Valley Transportation Co.; four for the Minnesota Steamship Co.; four for the Menominee Transportation Co.; two for the Owen Line, of

Chicago; one for the Brown Steamship Co.; one for the Republic Iron Co., and one for the Lorain Steamship Co.

The company's plant—except the shipyard, which is on the old river bed at the foot of St. Paul street—is located along Center, Elm and Spruce streets, their celebrated foundry being on the second-named thoroughfare. The several buildings are fitted up with every necessity for producing the best of work in phenomenally short time—the company's chief desideratum. In addition to its shipbuilding contracts, the works turn out marine machinery and engines and boilers of every description. At present 1,200 men are employed in the various departments, the weekly pay-roll reaching $13,000. As a single item indicative of the immense consumption of material in the business, it may be stated that the works used 15,000 tons of metal in 1889, representing 45,000 tons of ore and 35,000 tons of coke.

The officers of the company for the present year are H. M. Hanna, President; J. F. Pankhurst, Vice-president and General Manager; Luther Allen, Secretary and Treasurer. The office is at the corner of Center and Spruce streets, immediately adjoining the works.

The present success of this great establishment is not phenomenal in its way, but is rather the result of legitimate and permanent growth, brought about by the highest quality of business experience; and to General Manager J. F. Pankhurst, who founded the original Globe Co. and reorganized the second, much of this result can be justly ascribed.

CLEVELAND IRON MINING COMPANY.

Midway in that wonderfully prolific ore belt which lies across Northern Michigan, stands the iron range from which, during 45 years of constant operation, the Cleveland Iron Mining Co. has drawn its millions of tons of ore. The company's mines, recognized as unsurpassed in productive richness, are in the county of Marquette, some 15 miles inland from the city of the same name, and so far have given their operators every reason to believe that they are practically inexhaustible. Any doubts to the contrary which could exist in the face of two score years of successful working, must have been swept away last year by the fact that the company's output was the largest in its history.

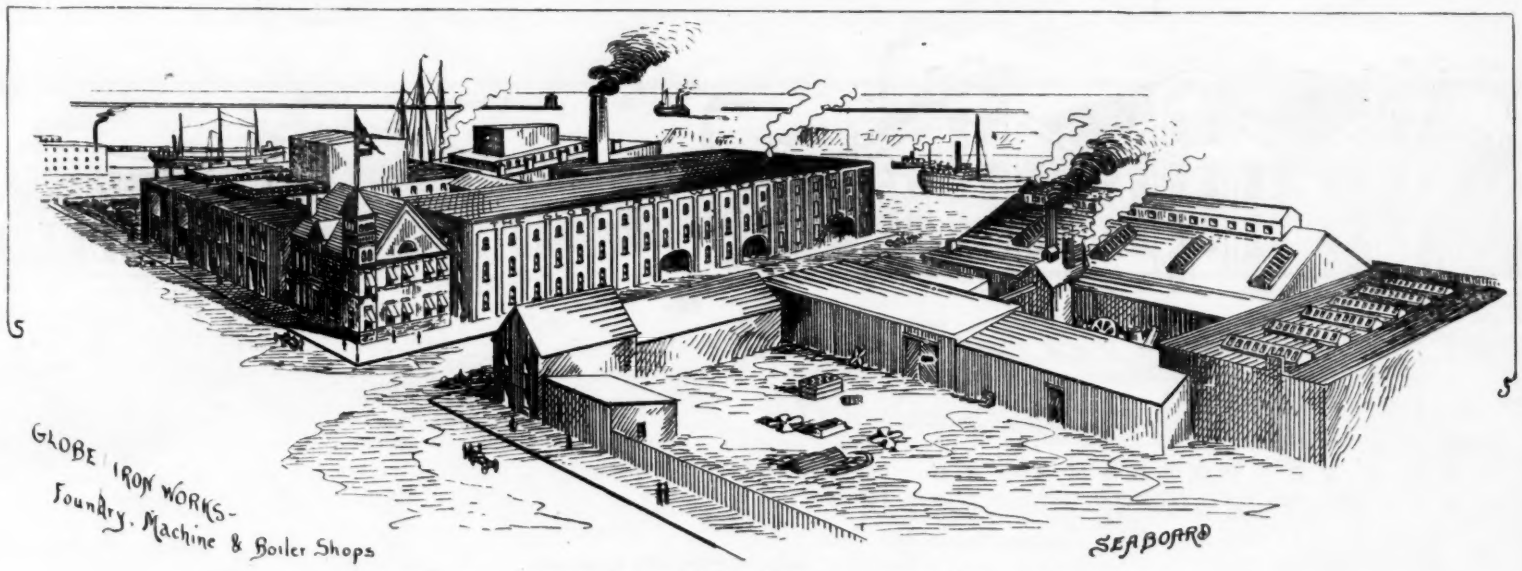
The Cleveland Iron Mining Co. is one of the oldest—if not the actual senior—of the Lake Superior mining corporations. It was originally organized under a special act in 1850, and reorganized in 1853, under the State laws of Michigan, with a capital of $500,000, and a board of directors, whose individual members were to become widely known in the business world. The present year found but one surviving member of this original board, Mr. Samuel L. Mather, late President and Treasurer of the company, who, on October 8th, passed from this life, mourned alike by the associates and friends gained during a half century of unimpeachable business activity, and by the community generally.

From the original $500,000, the company's capital stock has increased to $2,500,000, and its operations have been steadily augmented, until, as has been stated, its greatest year of business was 1889. The mines are fully equipped with the latest and most improved hoisting, ventilating and other machinery, and give constant employment to between 500 and 700 men. This large force is scarcely sufficient to supply the constantly growing demand for the company's ore, it being widely recognized by consumers and the trade generally as unsurpassed in evenness, richness and in other points of general excellence. The ore has been so long on the market, and so thoroughly tested in every possible way, that its adaptability is perfectly understood and its merits acknowledged wherever iron ore is used. Its market includes many of the upper lake furnaces, while large quantities are shipped to Chicago and Milwaukee and other Western cities. The local Cleveland market also uses a heavy proportion of the output and is, as well, a central depot from which the ore is shipped by rail to many furnaces in Ohio and Pennsylvania.

In 1889, the company, in order to facilitate and expedite the shipments of its product, contracted with the Cleveland Shipbuilding Co. for two modern steel steamers. The vessels were constructed with a view to a happy combination of strength, speed and carrying capacity, and are looked upon as models of their kind. They are christened Pontiac and Frontenac, and the former carries the champion broom for the largest load of iron ever carried down from Escanaba—2,939 tons. The capacity of the Frontenac is but a few hundred tons less than that of its sister ship, and the two together are equal to a numerous fleet of the lake craft of but a few years ago.

The success of the Cleveland Iron Mining Co., its vast and ever-increasing business—the yearly sales average above 250,000 tons—is largely due to the careful and able way in which its progress has been fostered and built up by the wise officials who have directed its affairs. It has been managed, for the most part, by practical men who have grown up in its offices. Its boards of directors have included men known far and wide for their high financial standing and staunch integrity, and these boards have suffered but few changes in their make-up. In particular, the guiding hand of the late S. L. Mather, foremost in the company from the hour of its inception, has had a marked, and really incalculable influence on the welfare of the corporation. He, and a few far-sighted associates, recognized at a glance the immensely valuable nature of the Marquette iron mountains, and 40 years of successful operation—with an outlook that promises an almost unlimited future production—has proved the wisdom of his early conclusions.

The officers of the company elected for the present year were: Samuel L. Mather, President and Treasurer; William G. Mather, Vice-president; Frederick A. Morse, Secretary. The Board of Directors consisted of Selah Chamberlain, Samuel L. Mather, William G. Mather, Truman P. Handy, Jeptha H. Wade, W. J. Gordon, J. H. Wade, Jr., Peter White and E. R. Perkins. All of these gentlemen, with one exception, Mr. Peter White, were prominent citizens of Cleveland. Death left two gaps in this body during the present year, removing Mr. S. L. Mather and the late Jeptha Homer Wade—another public-spirited citizen, whose widely recognized merits were as widely mourned, and whose liberal gifts to the city of his adoption—to its people and its institutions—remain as enduring monuments to his open generosity and wise benevolence.



GLOBE IRON WORKS COMPANY—FOUNDRY, MACHINE AND BOILER SHOP.

The commodious general offices of the company are in rooms 4 and 5 in the Mercantile Bank Building, corner of Superior and Bank streets, in this city, a central and readily accessible location.

THE WALKER MANUFACTURING COMPANY.

[ILLUSTRATED.]

Eight years ago the Walker Manufacturing Co., of Cleveland, was organized for the introduction and manufacture of improved power transmission machinery, with Mr. John Walker, the mechanical head, as Manager; who previously was known throughout the country as a most thorough mechanic, inventor and practical manufacturer in this line; stock of the company being given him for existing and such other patents as should be granted him in this line.

Works were built at the foot of Waverly avenue, on the L. S. & M. S. railway, which were presumed would prove adequate for years, but the overcrowded condition from the completion of the original works necessitated numerous and large additions, notwithstanding which it has severely

taxed the energies of the management to supply the work which has almost been forced upon the company; and for nearly three years past has necessitated operation day and night.

During the earlier days of its existence this company received a serious blow in the sudden death of its first President, Mr. Herbert F. Taylor, then of Taylor & Boggis, among the most prominent iron founders of the city, who was a moving spirit in the organization of the company; a man of large experience in general manufacturing, and consequently relied upon largely by the directors of this company in promoting its success. Mr. George W. Gardner was the second President, and at the time of his withdrawal for other duties requiring his attention, Mr. J. B. Perkins was prevailed upon to assume the presidency, which office he has since retained, and is now the largest individual stockholder.

That the institution has been a financial success from its organization, in spite of trying difficulties, and has succeeded in building up a reputation for its work second to none, attest the ability and faithfulness of the practical managers. The deep interest in the welfare of the company shown by the President, and his counsel and substantial aid to the practical management, contribute in no small degree to its success.

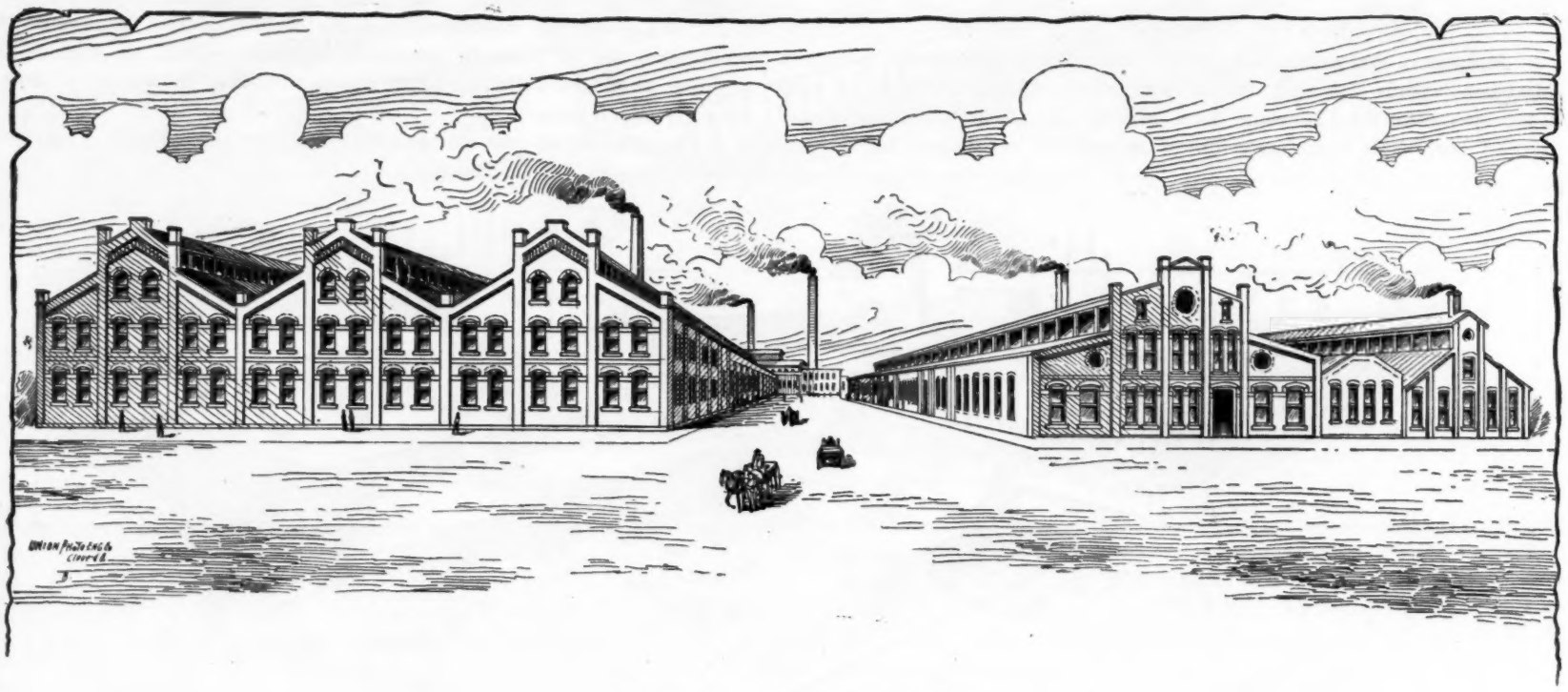
The force of men employed having increased from 50 to 500, and the character of the work growing gradually into heavier machinery, suggested the desirability of improved and enlarged facilities to cope with and accomplish with greater economy and dispatch the demands of the trade for the heavier class of machinery for which the company had acquired so enviable a reputation; in view of which the directors decided on very extensive improvements during the present year, which are now nearly completed, and are expected to excel anything of the kind in this country.

The new buildings are fire-proof, constructed of brick, iron and glass, and illustrate the most advanced practice in this class of architecture, reflecting great credit upon the ability of Mr. F. Felkel, the architect, who has had a large experience in both this country and Europe. The main foundry is 117 feet wide and 290 feet in length; the central bay of same being 55 feet in width and provided with power traveling cranes of 60 tons capacity; the lighter and medium grades of work being provided for in the side bays, where several power traveling cranes of 12 tons capacity each furnish convenience for handling. The machine and erecting shop building is 165 feet wide, divided by two rows of iron columns 24 feet centers longitudinally into three bays of 55 feet each; two of which are 290 feet long, while the third is 430 feet long. Power traveling cranes of 25 tons capacity each supply this building with necessary means of handling work in the most expeditious manner. Light and convenience have been most carefully considered and with best results. Pattern and smith shops are also provided with best of facilities, and there is a large building conveniently arranged for pattern storage. In fact, most of their six acres of ground will be covered by handsome buildings.

Some of the work turned out by the company is quite phenomenal when their past facilities are taken into account. During the early part of this year a mammoth cut gear 31 feet diameter, weighing 67 tons, was supplied a South Africa mine; all the rest of the machinery, including engine on which this gearing was used, was made in Europe. Among many large pulleys supplied, there are now in the shops, partly completed, one 24 feet diameter by 65-inch face pulley, weighing 60 tons; and two 22 feet diameter by 47-inch face pulleys weighing 40 tons each; which are being made for the new rod mill of the American Wire Co., of this city. These pulleys are located on one crank shaft and are to transmit 4,000 horse-power, the periphery speed of the large pulley reaching the enormous velocity of 8,000 feet per minute.

The cable railway machinery as manufactured by this company has a pre-eminent and widespread reputation, not only for the superior character of work but the valuable inventions in this machinery exclusively supplied by this company. Aside from the magnificent machinery furnished the Cleveland City Cable Railway Co, they have equipped 12 other roads from Portland, Ore., to Washington, D. C., and also have furnished their patent differential drums to several others. In machine molded gearing, large pulley and band wheel work the company holds a position quite superior to any other in the country. Power traveling cranes of a most improved type, embodying quietness of operation and steadiness of motion, are also among its manufacturers, as well as hydraulic machinery of every description, consisting of riveters, shears, presses, cranes and all such classes of machinery on which the higher pressures can be used advantageously.

This company is already in the front as one of Cleveland's most important factors in manufactures, and with its improved facilities and increasing business will soon be one of the staunchest concerns in the country. The present officers of the company are: J. B. Perkins, President; John Walker, Vice-president and General Manager; W. H. Bone, Manager; Z. M. Hubbell, Secretary and Treasurer.



WALKER MANUFACTURING COMPANY.

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THE BRITTON ROLLING MILL COMPANY.

The establishment of a new rolling mill in our city is at all times a matter of considerable commercial importance, and when such an enterprise is backed by a name of high standing in manufacturing circles, it becomes a subject of more than ordinary interest.

From time to time we have noted in *The Iron Trade Review* the fact that the Britton Rolling Mill Co.'s works were in course of construction, and, as part of them are about ready to begin operations, a description will be of interest. Mr. J. W. Britton, founder and formerly President of the Britton Iron & Steel Co., having sold his interest to Mr. John D. Rockefeller, and withdrawn entirely from that company, recently purchased a tract of land excellently appointed for rolling mill purposes. The property consists of eleven acres, situated on the Lake Shore & Michigan Southern Railway, at Hoyt avenue, in this city. It has a frontage of about 700 feet on the railroad and runs north 1,000 feet to the lake. There are two switches running in from the railway, one on the east side, and the other through the center of the property; these, with the Pennsylvania Co. only a few rods distant, give excellent receiving and shipping facilities. The first building, which is now nearly completed, is 160 feet by 134 feet, the main span being 62 feet, having a shed roof on either side of 36 feet, the whole of which is covered with corrugated iron, the sides being beaded iron. In this building is the three-high plate train and a sheet mill. The engine is a 32x60 Reynolds Corliss, made by Allis & Co., of Milwaukee. The steam will be from three Hazelton Tripod boilers, of 175 horse-power each; one placed over each of the three heating furnaces. The entire mill will be paved with fire brick, except where floor plates are necessary;

and it will be equipped with the latest and best machinery in the way of shears, over-head tramways, etc., and a Britton patent leveling machine, as absolutely level sheets of all kinds will be made a feature of the works. The product of the mill will be plate and sheet steel, special attention being directed to the production of soft steel sheets for stamping and blanking, with clean, smooth surface, pickled before finished and rolled carefully as to gauges.

Mr. Britton goes to England soon to look into the manufacture of tin-plate, as it is his intention, on his return in the early Spring, to add more sheet mills, a galvanizing and tin-plate works.

The company will be stocked for $250,000, and, with this ample capital and Mr. Britton's recognized experience in the manufacture of sheet metal, the success of the new enterprise should be assured.

THE UPSON NUT COMPANY.

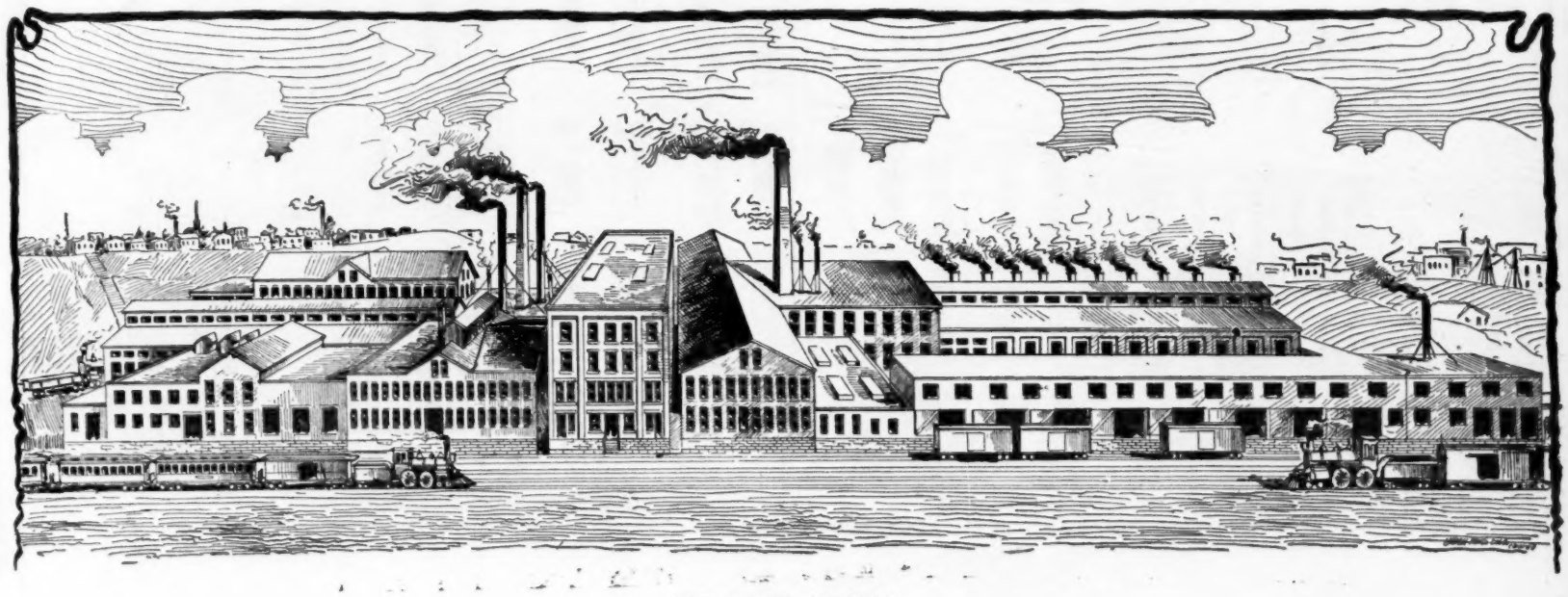
[ILLUSTRATED.]

Cleveland possesses a number of manufacturing plants, whose annual output exceeds all competitors in the same lines of trade. In this respect our city undoubtedly surpasses each of her municipal rivals. Prominent among these great establishments is the Upson Nut Co., whose combined output of nuts and bolts is ahead of that of any similar establishment in the nation. The company's plant is divided between Unionville, Conn., and Cleveland, the Unionville works being the parent stem from which the Western branch sprang. The original Connecticut establishment, from which the present company originated, was started in 1854, and the Cleveland branch came into existence 18 years later, in 1872. For over 30 years the company has continued under its present management.

The parent house started in 1854 with 20 hands; in 1890 the plant now finds employment for about 900 men, the majority of them being connected with the Cleveland branch. The output includes nuts, washers, bolts and carriage hardware, and the goods find a ready market in every section of the country, the trade extending outside to South America and Australia. The Upson Nut Co.'s product is recognized by consumers as invariably first-class, and its high standard is rigidly maintained. The special lines of goods produced by the house include a great variety of hot-forged and hot-pressed nuts, also cold-pressed nuts, wrought and cast iron washers, common carriage bolts, Philadelphia Eagle carriage bolts, tire bolts, stove bolts, shaft bolts, spring bolts, whiffletree bolts, elevator bolts, track bolts, stud bolts, bridge bolts, plow bolts, machine bolts, bolt ends, coach screws, hanger screws, set screws, boiler and bridge rivets, Norway rivets, axle clips, saddle clips, felloe plates, boxwood and ivory rules, levels, try-squares, bevels, iron and wood planes and belt fasteners.

The Cleveland works are located on the C., C., C. & St. L. Railway, at the N. Y., P. & O. crossing, close to Scranton avenue. They are fitted up with special machinery that turns out the immense and varied product in incredibly short time. As an indication of the amount of raw material used, it may be stated that over 20,000 tons of iron and steel enter into the manufactures in the course of a year. Large quantities of brass, German silver and ivory, are also used, and considerable boxwood, rosewood and other hardwoods, most of this latter material being turned into mechanics' tools, of which the Unionville factory makes a specialty.

The present officers of the Upson Nut Co. are Mr. A. S. Upson, President, who has been connected with the establishment since 1857; Mr. S. Frisbie, Treasurer; Mr. L. A. Gleason is Superintendent of the nut department, and Mr. F. A. Smith, Superintendent of the bolt department.



UPSON NUT COMPANY.

The Cleveland office is located in the works, and branch warehouses have been established at 99 Chambers street, New York City, and 232 Lake street, Chicago.

THE THOMSON-HOUSTON ELECTRIC COMPANY.

If the diffusion of more light through the world and the illumination of dark places be, as we are told, of benefit to humanity, then the introduction of electric lighting is decidedly a great moral event. If this be granted—and who so stubborn as to deny it?—the Thomson-Houston Electric Co. can justly be regarded as an eminent moral factor. There are, at least 23 recognized electric systems in operation in this country; the Thomson-Houston system, as one of them, is used more generally than all the other systems combined, the number of arc lights produced by it being nearly three times that of its closest competitor. The officials of the company claim that this is accounted for by a simple combination of cold, unanswerable facts, namely, that their light is the nearest perfection, the most economical and is always absolutely reliable. That these assumptions are based upon a solid foundation would appear to be indicated by recently compiled statistics. It is certain that the Thomson-Houston Co., from its central location at the Hub, is shooting out its innumerable spokes of wire to all corners of our nation, and whether they finally flash into dazzling brilliancy or serve to convey the unseen mighty power which sets the belts of factories in motion and moves the wheels of rushing cars, when the system does come it comes to stay, and those who are familiar with its merits will have no other.

Locally, the Thomson-Houston system has become an important fixture and valuable improvement. A very large majority of both the arc and incandescent lamps in the business portion of our city are of the Thomson-Houston brand, and the city's finest buildings are lighted from the same source; among them, those splendid examples of architectural perfection, the Society for Savings new structure and the Perry-Payne Building. Hundreds of Cleveland's factories, large and small, obtain their power from the Thomson-Houston power station; for this mighty force can be equally utilized to start the mechanism of a sewing machine or direct the stroke of a ponderous trip-hammer.

The Brooklyn Street Railway Co., which has had the Thomson-Houston system in highly successful operation on all its lines for the past year, adopted it after a careful examination into the merits of all others; and the officials of the road have had no occasion to doubt the correctness of their judgment. In fact, the remarkable rapidity with which the Thomson-Houston electric lighting apparatus and electric railway equipments are being introduced throughout the country is evidently indicative of a spread of the same sentiment regarding the system which is felt for it here in Cleveland.

The Thomson-Houston is the only electric company whose lights are under an absolutely perfect automatic regulation. The value of this attachment can scarcely be appreciated—except by those specially instructed in electrical apparatus. It serves, to quote the language of an expert, to give "to the installation its character for reliability, economy and efficiency."

Another special feature of excellence about the Thomson-Houston system, and one which draws the admiration of capitalists and financiers, is the fact that no other stable investment of the present day can equal it for big and quick returns to investors. This has proved to be the case wherever local companies have been established, all of which goes to show

—as has been already asserted—that the system is founded on a permanent and unquestionably solid basis.

The office of the Ohio general agency of the Central Thomson-Houston Electric Co., a branch of the parent corporation, is at 215 West 4th street, Cincinnati. The agent of the company in this city is Mr. W. R. Caulkins, whose office is in room 1002, Society for Savings Building.

THE INGERSOLL MILLING MACHINE CO.

[ILLUSTRATED.]

There are few special manufactories in the city that can show as rapid an increase in business—an increase based on permanence and constantly growing, as does the Ingersoll Milling Machine Co., whose office and factory are on the corner of Kirtland and Lake streets. The making of milling machines does not often become a special product of a manufactory, and when it does so, it would appear that the output must possess certain particular merits that are calculated to give it a wide market. This is evidently the case with the Ingersoll Milling Machine Co., for they are obliged to confine themselves exclusively to the production of their large slab milling machine and patent cutter, and then find it difficult to keep up with the demand. The company has been in existence for five years, having succeeded to the business of Eynon & Ingersoll, who originated the factory. At the time of the purchase the working force of the concern consisted of three men, and the output included a variety of special milling machinery. Now the Ingersoll Co. employs 45 hands all the year round, and makes only slab milling machines and patent cutters. This increase has been brought about mainly within the last two years, or as soon as the merits of the Ingersoll products could be fully understood by the trade.

The Ingersoll large slab milling machine is highly esteemed far and wide as the demand for it indicates. For finishing any kind of work, where there are several parts of one kind, this machine will do as much work as three planers. The concern is at present turning out six of these machines every month. The patent milling cutters are another specialty of the works, and are produced in large quantities. They can be made any size or shape.

The company's factory is roomy and well-located, and fitted up with improved machinery, much of it of a special character. The present officers of this successful corporation are Winthrop Ingersoll, President and General Manager, and Robert H. Clark, Secretary and Treasurer.

THE BRUSH ELECTRIC COMPANY.

The name of Brush is firmly linked with the fame of Cleveland. The modern Aladdin, with his wonderful lamp, not only brought his pillars of fire by night into the city of his home, but also added the cloud of smoke by day—the latter hanging above that great hive of industry, the Brush Electric Co.'s works. For ten years this renowned factory has been in ceaseless operation, giving employment to many hundreds of men, and turning out products whose values aggregate into the millions of dollars.

The Brush Electric Co. is an outgrowth of the Telegraph Supply Co., organized in 1875, which nurtured the young inventor's efforts until success finally came. Then, in 1880, the corporation became the Brush Electric Co., and began to manufacture in a comparatively small way, on the corner of St. Clair and Ontario streets. Burned out there, the company removed to a factory, near Euclid station, work on the present mammoth plant commencing at the same time. When completed the company were in possession of the most extensive electrical works in the world. They covered seven acres of area; they included a main machine shop, 265x122 feet; a power building, 120x110 feet; a carbon department, 600x62 feet; a pattern room, 120x70 feet; the "cathedral," 200x100 feet; coke house, lumber room, oil room, tin shop, blacksmith shop, stables and other smaller apartments. Here have been made a vast number of dynamos, electric lamps, electro-plating apparatus, electric motors, carbons and other kindred articles, many of which the Brush Co. was the first to produce. The works are fitted up with special machinery, while at every turn will be seen some ingenious labor-saving device, invariably the invention of a Brush employe. A walk through the works will offer convincing proof, as nothing else in this neighborhood can, of the mighty extent to which the electrical industry has attained in a single decade.

Just now the company is devoting a large share of its attention to the production of the outfit of the Short Electric Co., a comparatively new company, owning an improved electric motor. The Short is a Michigan corporation, but Cleveland parties are heavily interested in it, and its main office is located on Belden street, adjoining the Brush offices. The "cathedral" of the big plant has been somewhat altered in shape to admit of the special machinery used in making the Short motors, and the company is now prepared to turn them out in large quantities. The new motor appears to be gaining rapid headway in popularity, and large orders are already testing the capacity of the works. The magnificent drawing-room cars of this line, recently exhibited on Cleveland streets, were built by the Brush Co., one of them costing $10,000.

The present officers of the Brush Electric Co. are: G. W. Stockly, President; J. J. Tracy, Vice-President; J. Potter, Treasurer; S. M. Hamill, Secretary; L. B. La Vake, Assistant Secretary; Chas. W. Phipps, Superintendent.

INGERSOLL MILLING MACHINE COMPANY.

PICKANDS, MATHER & CO.

In 1883 the firm of Pickands, Mather & Co. was organized in this city, and at once became a prominent addition to that quota of heavy operators whose existence grows out of the ore and coal trade. The business of the new house was the mining and shipping of iron ore and coal and the manufacture of pig iron, and in these channels of trade Pickands, Mather & Co. soon became widely known. The firm consists of Col. James Pickands, Samuel Mather and Jay C. Morse, the latter of Chicago. Colonel Pickands has long been known to the business world in connection with the

lines of traffic now engaged in by his firm, and his experience and high commercial standing are widely recognized. Mr. Samuel Mather has from his boyhood been in familiar contact with mines and mining operations, and this practical experience is used to great advantage in his present business connection. Mr. Jay C. Morse is looked upon by the trade as one of the best posted mining authorities in the country. Formerly a resident of Marquette, he is now located in Chicago, where, in addition to his connection with Pickands, Mather & Co., he holds the position of President of the Illinois Steel Co.

The ore shipped and handled by the firm comes from mines at Vermilion, Minn.; the Gogebic range, Wisconsin and Michigan; and the Marquette and Menominee ranges in Michigan. In a number of the mines producing this output, the firm is financially interested, and has been instrumental on frequent occasions in opening up and developing new mining properties, all with marked success. In bringing the ore down from the upper lake region, the firm keeps its own fleet of vessels constantly employed during the season of navigation, and has been singularly fortunate in its exceptional freedom from delays and disasters in this connection. The coal shipped by the firm is known as Pittsburgh District coal, and its handling and distribution forms a large proportion of the company's business.

As the trade of Pickands, Mather & Co. expanded, it necessitated the establishment of manufacturing plants at various convenient business centers, the firm now having in operation one pig iron furnace in this city; two in West Middlesex, Penn.; one at Sharpsville, Penn.; and one at Struthers, O. In addition to these the company has a charcoal furnace in operation at Depere, Wis. The present capacity of these furnaces is about 700 tons daily. The number of employes in the company's service, including the miners, furnacemen, coal handlers, dock men, and vesselmen make a small, though widely-scattered, army.

In connection with its shipping business, the firm owns docks in this city, Ashtabula and Buffalo, all constantly utilized. By owning its own docks, the firm is enabled to handle its cargoes without delay, and in the lake trade, where time has become rather more than the equivalent for money, expedition is a permanent necessity. By no firm is this necessity kept more plainly in view, and it is undoubtedly due to this fact that the company can ascribe much of its commercial success.

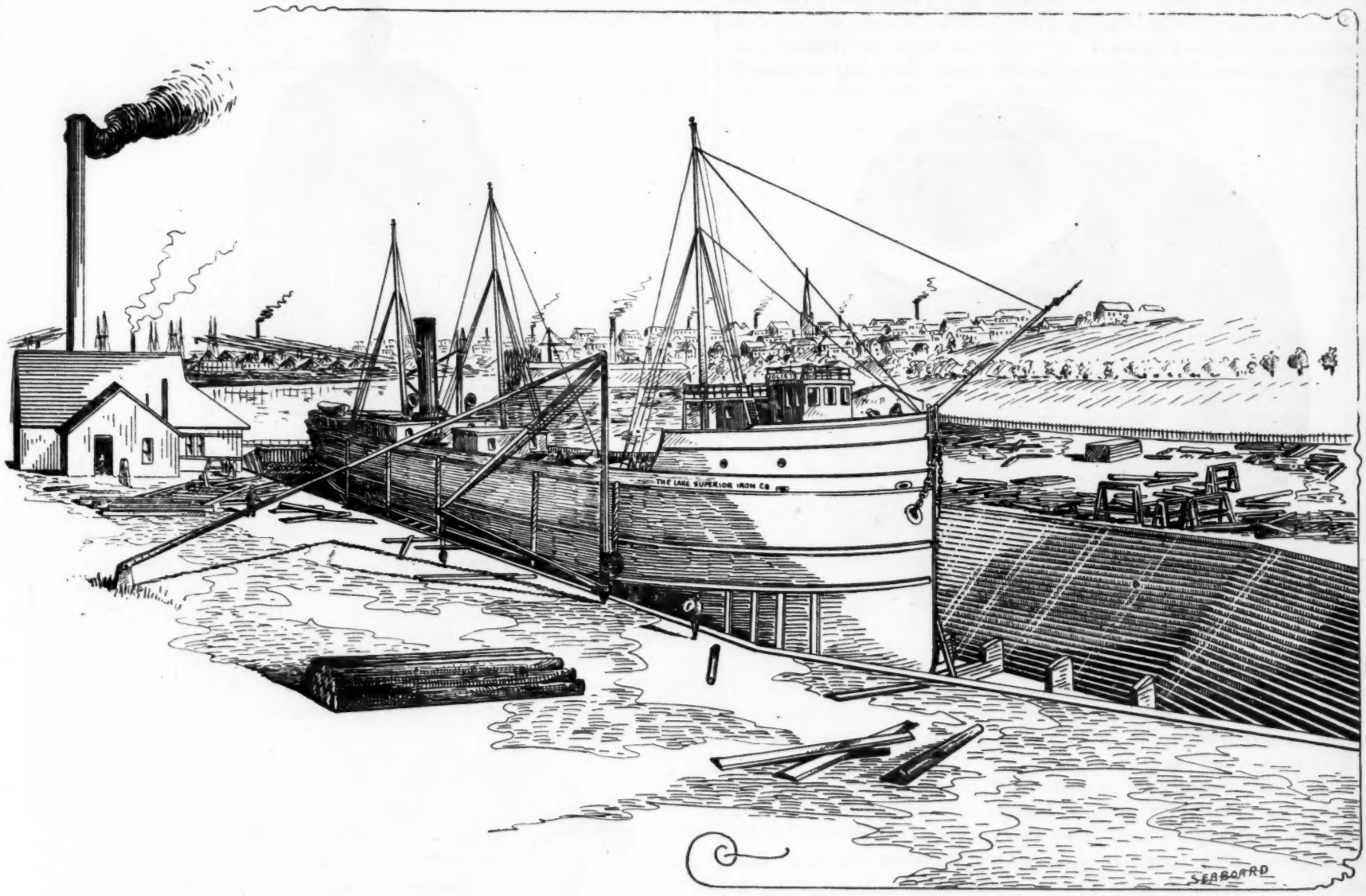
The course of the firm during the seven years of its existence has been one of unvarying advancement and extension. This can undoubtedly be ascribed to the wealth of experience which dictates its policy, and to the energy and faithfulness of the employes by whom this policy is carried into effect.

The general offices of Pickands, Mather & Co. are located in the Perry-Payne Building, in this city.

THE AVERY STAMPING COMPANY.

[ILLUSTRATED.]

It was recently shown by a comparison of statistics that Cleveland, as a city of inventors, outstrips, in proportion to her population, all other cities of the nation. The number of patents asked for by Clevelanders proves this fact, and the useful inventions indicated thereby are quite incalculable in value. Prominent among these are the inventions owned by the Avery Stamping Co., of this city, whose extensive and rapidly-increasing business attests to the merits and importance of the patents they hold. The company grew out of the Avery Elevator Bucket Co., organized in 1886, and located at the corner of Lake and Wason streets. In 1888 the establishment was removed to the present grounds, corner Lake and Coe streets, where every facility for extending the business is at hand. The area owned by the company has a frontage on Lake street of 865 feet, with a depth of 339. Upon this plat stand the factory buildings, two in number, each 264 feet deep, with 80 feet span. A switch from the Cleveland & Pittsburgh Railway runs from the main line, only a short distance away, to the works, affording the best of rapid shipping facilities. The original corporation employed 50 men; the great increase in the business now gives steady work to 250. Their duties are supplemented by an extensive outfit of labor-saving machinery, much of it necessarily of a special character, the mode of manufacture involving a number of original features.



SHIPOWNERS' DRY DOCK COMPANY.

The specialty of the Avery Stamping Co. is the stamping of sheet metal, more especially heavy stamping, in which class of work they excel all previous attempts. In the wrought steel bowls stamped by them, they overcome what was looked upon as a mechanical impossibility. Theirs was the first attempt at this work in the United States; the only bowls bearing any resemblance to theirs coming from Sweden. These bowls are used in cream separator machines, and are subjected to a pressure produced by rapid centrifugal force which no cast bowl could be made strong enough to withstand. The company is now turning out numerous articles of this

steel hollow ware in large quantities. The Bronson Supply Co., who handle a portion of the factory's output, alone finding a market for over 2,000 pieces per day. In making this Bronson Supply Co. ware, known to the trade as the "Never-Break," the metal is put into the required shape from the flat sheet without displacing any of the metal, leaving the latter the same thickness throughout as in the original sheet. The "Never-Break" brand covers every form of domestic cooking utensils, which are now recognized as the very best, most durable, and consequently most economical that the market supplies. Each piece bearing the brand is guaranteed not to break, crack, warp or leak. A large part of the the company's output is contract work for elevators using the Avery seamless steel bucket, the only elevator bucket of the kind manufactured. In the production of all their work the establishment uses only the extra fine open-hearth steel, and every piece in their output is warranted. The market for the company's products extends from the Red River of the North to the Gulf of Mexico, and from ocean to ocean, the Pacific Coast trade developing into heavy proportions. Outside of our own nation the goods are now shipped to Scotland, Germany, Denmark and Austria, the foreign trade being already extensive, and rapidly increasing.

The surprising success of the company, gained in so brief a time, and evidenced by the fact that its goods are to be found in every section of the country, is a gratifying proof of the high rank its product takes. Individual orders coming from the most remote places, show that the name of

the concern is penetrating wherever civilization extends. All of this success can be set down as due to the company's perseverance in conquering methods of manufacturing hitherto deemed impossible; to its enterprise and high business character, and lastly to the unvarying excellence of every piece of goods which leaves its works.

The Avery Stamping Co. is stocked at $500,000, and holds a valuable line of patents covering its elevator buckets and other specialties. The office of the company is located in the works, corner Lake and Coe streets, and the present officers are: Joseph Perkins, President; Ralph A. Harman, Vice-President; Douglas Perkins, Secretary and Treasurer; A. E. Bronson, Manager; F. W. Judd, Superintendent.

OSBORN MANUFACTURING COMPANY.

Important industries are continually springing up in this city, the extent and success of which are frequently matters of surprise to the general community. For instance, the manufacture of fine spring-tempered steel wire brushes and brooms has become so important an industry that there is scarcely a city or town in the country where they are not used to some extent. Cleveland possesses the largest manufactory making a specialty of these articles in the world. This is the Osborn Manufacturing Co., which makes steel wire brushes and brooms, boiler flue cleaners, isinglass whisks, branding iron brushes, painters' dusters, scratch brushes and the celebrated "Dandy" horse brush, which is meeting with such an extraordinary sale at the present time. In fact, they make brushes and brooms for every conceivable purpose; from heavy flat wire for foundry use, and round wire as fine as hairs, for dusters, fine sweeping brooms, and similar purposes. The fine steel brooms and painters' brushes are gaining a well-deserved reputation throughout both this country and Europe.

The company's trade extends from ocean to ocean, from Canada to the Gulf, and is supplemented by a large foreign business, conducted through their foreign office, Rue de la Consolation 89, Brussels, Belgium.

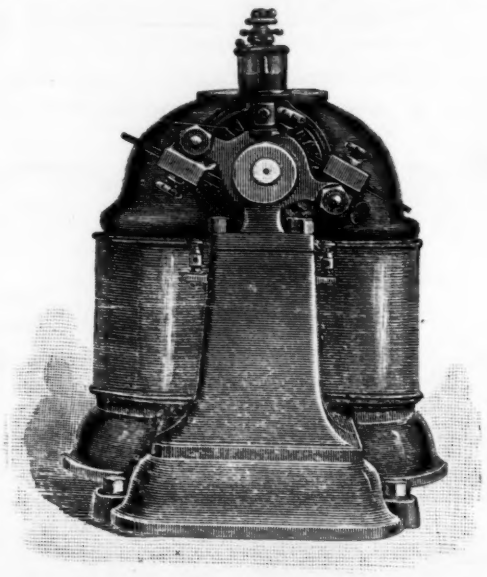
The secret of their unrivalled success is that they make the best goods that unequaled facilities and the highest grade of skill can produce. By using the most approved machinery they are enabled to turn out good work cheaply, and by employing only experienced workmen, and using the best material that can be procured, they maintain their ascendancy over all competitors.

Their main offices and factory are situated at Huron and Sheriff streets, where their manager, Mr. F. Wayland Brown, makes his headquarters.

THF FORD & WASHBURN ELECTRIC COMPANY.

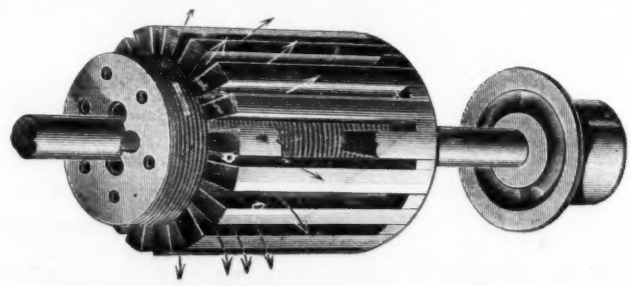
[ILLUSTRATED.]

One of the growing electrical companies of Cleveland, that has made a sudden and strong pull for popularity during the past year, is the Ford & Washburn Electric Co. Having a good thing in their improved armatures for dynamos, they propose to push it for all that it is worth. The claims made for this improvement are strong and, being backed up by work for some of the leading establishments of Northern Ohio, they appear to be well founded. The special improvement, which, they claim, puts their



dynamo far in advance of all others and places the use of electricity for lighting within the reach of the smallest plants, is its self-ventilating feature; but the dynamo itself possesses many points of superiority, attention to a few of which is herewith briefly directed.

The bed plates and brackets are one complete casting. The magnet yokes are wrought iron fastened to the bed plate, and the pole pieces are separate castings bolted to magnet yokes. The field cores are wound on separate shells, and are interchangeable for all machines of same size. The armature shaft is steel and of extra large size. The especial feature of their dynamo, as above stated, is the armature, which is self-ventilating. It draws a current of air from both ends and along the line of shaft and out



through the discs, which are separated, and through the winding, with openings to let the air pass out. The rapid rotary motion of the armature send out the current of air, which keeps the armature and pole pieces cool and therefore more effective than the old style which is so liable to heat up. This self-ventilating feature, it is claimed, is found in no other dynamo at present manufactured. It is adapted to both motors and dynamos. Fig. 1 shows the dynamo, Fig. 2 the armature, the arrows indicating the direction of the current. These dynamos are of high efficiency, and are rapidly being introduced into industrial establishments.

THE SEATON MANUFACTURING COMPANY.

The past year has been one of unprecedented success for the Seaton header, manufactured by the Seaton Manufacturing Co. It has obtained a place in many of the largest shops in the country—East and West—and gained a well-earned reputation wherever it has gone. Their rivet machine, track bolt header and carriage bolt header, cut from the bar head and eject automatically, which is claimed to be the most economic method. The chief points in their method are their stock gauge, cutter and ejector,

all secured by letters patent. Their ejector is positive, requiring no change for different lengths of bolts or rivets—always ready. They cut, head and eject flat, countersunk heads This device to release the heading die when the machine is "stuck," avoids any delay in starting again. The shear breaker is a new and improved device to prevent any extra strain on the bed or shaft. In Nos. 2 and 3 bolt headers, and in Nos 3 and 4 upsetters, they have placed their new automatic stop (patented), which keeps the movement of the heading slide and the dies under the perfect control of the operator, while all the rest of the machine is in constant motion, and the full momentum can be brought to bear on a single stroke or more. The simplicity and noiselessness of this stop movement will be greatly appreciated by every bolt maker and forger.

CLEVELAND ROLLING MILL COMPANY.

Little could the late Henry Chisholm have imagined that the plant his energy and shrewdness called into existence almost 30 years ago, would, in a brief time, become the leading individual manufactory of the city of his adoption, and be ranked among the very foremost of the nation. That is the record of the Cleveland Rolling Mill Co., whose progress has been identical with the progress of the city, and whose existence has been no small factor in accelerating the city's manufacturing growth.

The Cleveland Rolling Mill Co. was incorporated in 1863, its first plant being the Lake Shore mill, formerly operated by Stone, Chisholm & Jones. In 1864, the company's mills and blast furnace were established in Newburgh, which has ever since remained the main establishment. In 1882, the company erected two blast furnaces on the river, near Broadway, known as the Central Works, with a capacity of 500 tons of pig iron per day.

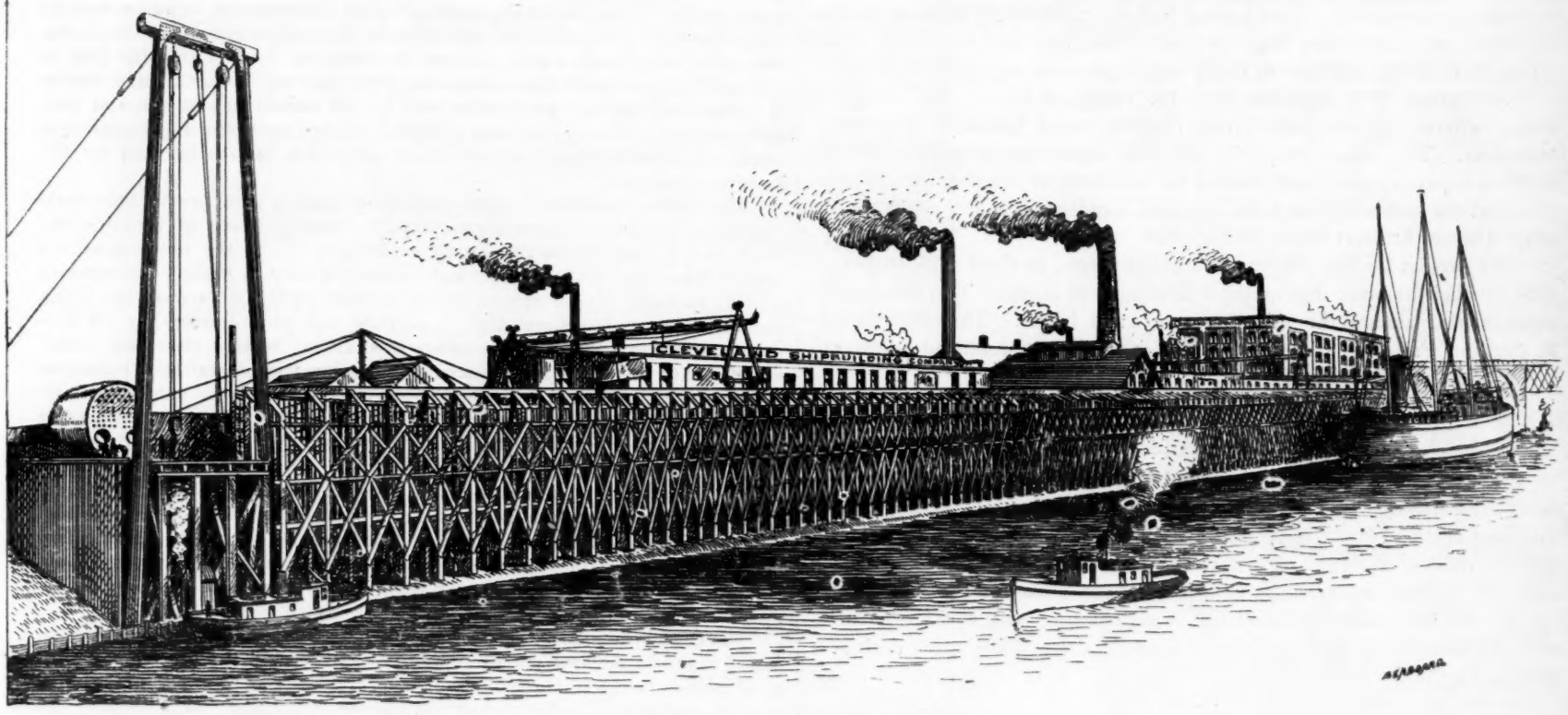
The average number of men employed by the company the year round is about 4,000. The value of the product will this year reach $8,000,000. The immense output indicated by this sum includes everything that the modern rolling mill is capable of turning out, with a special effort in the line of structural material, angles, channels, beams and zee-bars, the company's vast facilities enabling them to put these products on the market at a cost of production which few mills can compete against. The ore used by the company's mills comes direct from the best-known Lake Superior mines, the corporation controlling the Negaunee mine, in Northern Michigan, and owning large interests in other mining properties. A decided advantage to the company lies in the fact that it owns its own docks adjoining the Central Works, and at these the ore is unloaded direct from the vessels, without any intermediate transportation, an advantage of the utmost importance, which is enjoyed by but few other mills.

During the past six years, the plant of the company has been very greatly improved and enlarged—the Newburgh establishment now covering over 100 acres. Fully equipped with the most thoroughly-tested modern machinery, it is looked upon as one of the model iron plants of the world. The product of the mills finds a ready and extensive local market. Particularly in shipbuilding are the Cleveland Rolling Mill structural materials in constant demand. Outside the local market, the products are demanded throughout the length and breadth of the nation.

Upon the death of Mr. Henry Chisholm, the founder of the company, which occurred in 1880 and was looked upon as a severe loss to the community, Mr. William Chisholm, then a resident of Chicago, was called from that city to take his lamented father's place at the head of the company, a position which he has since filled. The present officers of the corporation are:

William Chisholm, President; W. B. Chisholm, Vice-President; Edward S. Page. Secretary. The directors are William Chisholm, W. B. Chisholm, Henry B. Payne, J. H. Wade, Jr., Edward S. Page, Douglass Perkins and George W. Howe. During the present year the board suffered the loss of Mr. J. H. Wade, long connected with the company, and a citizen widely esteemed for his practical benevolence and upright character.

The general offices of the Cleveland Rolling Mill Co. are in the National Bank Building, at the corner of Water and Superior streets.



CLEVELAND SHIPBUILDING COMPANY.

HILL CLUTCH WORKS.

To the general reader the nature of a friction clutch may be a profound mystery, yet, in the mechanical arts, this peculiar attachment plays a very important part. It plays an important part, too, among the industries of our city, for a big factory, with costly appurtenances and a large force of men, is devoted especially to the production of friction clutches. This is the Hill Clutch Works, situated near the foot of Waverly avenue, at the Lake Shore & Michigan Southern Railway crossing, where, in less than four years, an extensive and constantly growing business has been established. The proprietor of the works is Mr. H. W. Hill, who is both a mechanical engineer and successful inventor. He was making his specialties in, Chicago in 1884, but, being convinced that Cleveland presented better facilities, he removed here in 1886, and established the Waverly avenue works. The establishment is fitted up with machinery of a costly and intricate character, much of it of Mr. Hill's own designing, the Hill clutch being made on a new principle invented by him. The factory also turns out, in addition to the specialty already mentioned, all descriptions of power-transmission machinery, pulleys, shaftings, couplings, hangers and similar attachments, this part of the work being done to order. Mr. Hill's ability as an expert mechanician is also shown in the designing and arrangement of electric light plants, flouring mills, saw mills, and productive works of a similar character, and this feature of the business has become a large and important one—not exceeded in extent by any concern in the country. He is constantly adding improvements and extensions to the works, and finds his reward in an ever-increasing output and corresponding demand.

The Hill clutch possesses features of superiority which, its inventor believes, make it, by all odds, the most desirable friction clutch on the

market. Its mechanism is of a simple, yet thoroughly ingenious character, and it is made in the most perfect manner, all parts being nicely finished and accurately balanced. It is operated easily, without jar or start to the machinery, and all possibilities of breakage are carefully guarded against. One particularly excellent device in connection with the Hill clutch, is the interchangeability of the different parts. Each part is made strictly to gauge, and duplicates of any part may be ordered by number and will be found to fit perfectly. The peculiar advantage of this and the other special features of the Hill clutch will be thoroughly understood by all skilled mechanics, and have served to give it a market which extends through every section of our country, and bids fair to introduce it wherever machinery is in use.

Mr. Hill reports that the business of the past year was much in excess of that of 1889, and the outlook for 1891 is of the most encouraging character, promising an increase even over the yearly gains already noted.

THE HACKNEY HAMMER COMPANY.

The Hackney Hammer Co. was founded about two years ago by a party of gentlemen who had purchased the American and Canadian patents granted to Gilbert Glossop, of Yorkshire, England, on pneumatic hammers. The idea of the hammer was entirely novel, and only a very few had been built up to the time of the formation of the company here, so that it took some time to get all the details of construction of the different sizes into proper form. In fact it is only within a few weeks that any effort has been made to put them on the market. Now, however, the company have fitted up their works on Johnson street with the most modern and efficient tools, and have everything so arranged that they can build the hammer with economy and dispatch. And having had several different sizes in successful operation in their own forge for over a year, they feel warranted in offering them to the public as in every way superior to any other hammer.

Aside from their machine shop the company have a very complete forge, where they can show their different sized hammers in practical operation. The power required for their operation is so small and the work so superior, that those used to the old forms of belt hammers are surprised at the ease with which the hammer handles work for which, ordinarily, a steam hammer would be required.

We predict for the company a brilliant future, as there is an enormous field for their hammer that no other is capable of filling. The shop equipment is first class and the management in good hands. The officers are J. B. Perkins, President; F. C. Brooksbank, Vice-President and Manager; J. W. Smith, Secretary and Treasurer.

E. H. JONES & CO.

When expert knowledge, strict reliability, and good business management are combined, success is sure to come. The firm of E. H. Jones & Co., 223 and 225 River street, has obtained a wide reputation for superior work in the line of designing and erecting steam plants, and in constructing first-class heating systems. They are having great success in introducing the hot blast heating system into manufactories, one of their most recent contracts being to supply the new works of the Cleveland Printing & Publishing Co.

E. C. POPE.

For the past ten years Mr. E. C. Pope has been one of the most active handlers of ore and metals in this market. With a large acquaintance among iron men, an intelligent foresight as to the drift of events, and an enviable record for upright and honorable dealing, he has always stood deservedly high in the estimation of the trade. The best recognition of his ability is the fact that he is the sole sales agent of the famous Norrie and Pabst mines, whose united product for the year 1890, has reached 1,100,000 tons. Mr. Pope also makes a specialty of metals, such as copper, lead, tin and spelter. His office is at Nos. 10, 11 and 12, Arcade Building.

INDUSTRY FILE WORKS.

The Industry File Works (A. & H. Gough, proprietors,) were started seven years ago by C. Gough & Son. They now have 30 men in their employ and turn out 10,000 files per annum. Their trade extends to New York, Indiana, Michigan, Alabama, Virginia and Pennsylvania, and is growing very rapidly. Their product is strictly hand-cut work, and is all warranted, the Messrs. Gough being practical file makers.

THE LARGEST PATTERN WORKS IN THE WORLD.

Among the curiosities of business success we make note of the Gobeille Pattern Co., of this city. Pattern makers and pattern shops are everywhere, yet this concern, said to have been started, within the last decade, with three workmen and $1,700, has grown to be the largest pattern works in the world, with their own four-story brick factory, having nearly 200 feet frontage, and something like 100 pattern makers at work, full time, every business day in the year. While no person not in the employ of the company, is allowed in the shops, it is pretty generally understood that their success is due to division of labor, a fine equipment of special machinery, and, perhaps, the strange fascination of business men of the present day for dealing with big concerns from whom they can exact quick delivery. Many women are employed in certain departments.

LEADING INDUSTRIES OF THE CENTRAL WEST.

THE "CONLEY LANCASTER" DIRECT STEEL PROCESS.

[ILLUSTRATED]

There cannot possibly be a more important industrial process devised than one which shall produce a cheap and thoroughly practicable method for the production of iron and steel by a direct and continuous process—thus avoiding the waste, extra labor, cost of reheating and handling of the metal in the successive treatments involved at present even under the Bessemer process. This great disideratum has hitherto evaded attainment through various causes, mainly the unequal distribution of heat, the lack of proper or complete access to the ore in the retorts when necessary to manipulate it, with a lack of facility also in closely watching the stages of the process. All these disadvantages and drawbacks or defects would appear to be entirely overcome, at least, in the appliances and novel treatment that goes to make up the Conley-Lancaster process by which, indubitably, iron or steel of an improved quality may be produced from the most inferior or base magnetic or other iron ores, at a cost considerably and vitally less than a similar quality of metal may be produced by any other method as yet found; this, be it noted, at a plant-cost which is less than one half that of a blast furnace of the same producing degree, coupled with a materially smaller cost of maintenance, as well as cost for labor and fuel. But aside from such material advantages as comparative cheapness as to plant, coupled with economy in operation, there is the vital gain in this case of a process that produces steel from ores which were hitherto entirely unavailable for steel production, such as rich hematites and specular ores and magnetic rich ores—sea sand as well as phosphoretic and sulphuretic ores —that are so wide-spread and abundant and which cannot be used for the Bessemer process.

The Conley-Lancaster process consists of treating iron ore in horizontal regenerative deoxidizing retorts moulded in fire-clay, each of which at the front end, is provided with a small muffle-door, and at the rear end with a large sliding door, leading into, and connected with, a central open-hearth melting furnace. These retorts are supported within a furnace, but when treating evry rebellious ores high in sulphur and phosphorus, they are provided at the rear with a supplementary or auxiliary heating chamber. Intermingled with the ore under treatment and manipulation, is pulverized charcoal or coke, or hydro-carbon gas from the gas producers may be substituted, according to circumstances, and which combines with the impurities, and is passed off through the roof, by means of suitable pipes. When the ore is ready for removal from the deoxidizing retorts, which is ascertained by examination through peep holes, it is passed through the rear opening of the retorts, into the central open hearth-melting furnace, or when so constructed for exceptionally high phosphoretic and sulphuretic ores, into an auxiliary heating chamber, without exposure to the atmosphere, giving the ore no opportunity of again taking up oxygen, after being treated to the deoxidizing retorts.

The Conley-Lancaster system is chiefly based on the heating of the ore in closed regenerative deoxidizing retorts, in combination with a certain quantity of carbon, in the form of coke or other solid carbon, properly granulated, or when convenient, hydro-carbon gas may be substituted for the solid carbon. This, moreover, is the only process which dispenses with the use of limestone either as a flux or as a basic lining, (although the latter can be advantageously used for eliminating the last traces of phosphorus) which is a material gain, as there are iron districts where limestone is not readily obtainable. These important results are reached without the least complication; in the contrary, by a material simplification that dispenses with the costly blast furnace and blowing plants, converters and appurtenances, and substituting for them, simple deoxidizing and melting furnaces shown in the cuts herein. Thus, as is apparent, an enormous attendant expenses of fuel, renewals, repairs and labor involved in connection with the blast furnace plants, are saved. The regenerative deoxidizers, and also the central melting furnace are heated by the combustion of the gas with an admixture of air, after the manner of the ordinary regenerative furnace.

One very important feature in the Conley-Lancaster direct steel process is the facility by which ore under treatment in the deoxidizers is kept in the proper condition and at the exact temperature for eliminating both phosphorus and sulphur. Of course, the ore has, according to its varying proportion of these impurities, to be prolonged in its manipulation and treatment while in the deoxidizers. The purification, therefore, becomes more costly in proportion to the ore's increase of phosphorus and sulphur and the consequent additional time, heat and manipulation needed for their elimination. The simplicity and common sense system involved in this unique direct steel making process cannot fail to commend itself to all studious and practical minds.

To produce pure metallic iron or steel from iron ore it is necessary to dissever and dispel the 27 per cent. oxygen therefrom that is always found in combination with about 70 per cent. of metallic iron in the ore known as an oxide. Usually associated with this oxide of iron are impurities, such as phosphorus, sulphur, and silicious and earthy matters in varying proportions. Before placing the ores in the deoxidizers, it is crushed and pulverized and the

silica and earthy matter removed. It is then mixed with about 20 per cent. of finely pulverized charcoal or coke and placed in the closed deoxidizers where it is subjected to such varying degrees of heat as will successively drive off the various impurities and at last at a higher temperature expel the oxygen and leave a pure metalic sponge.

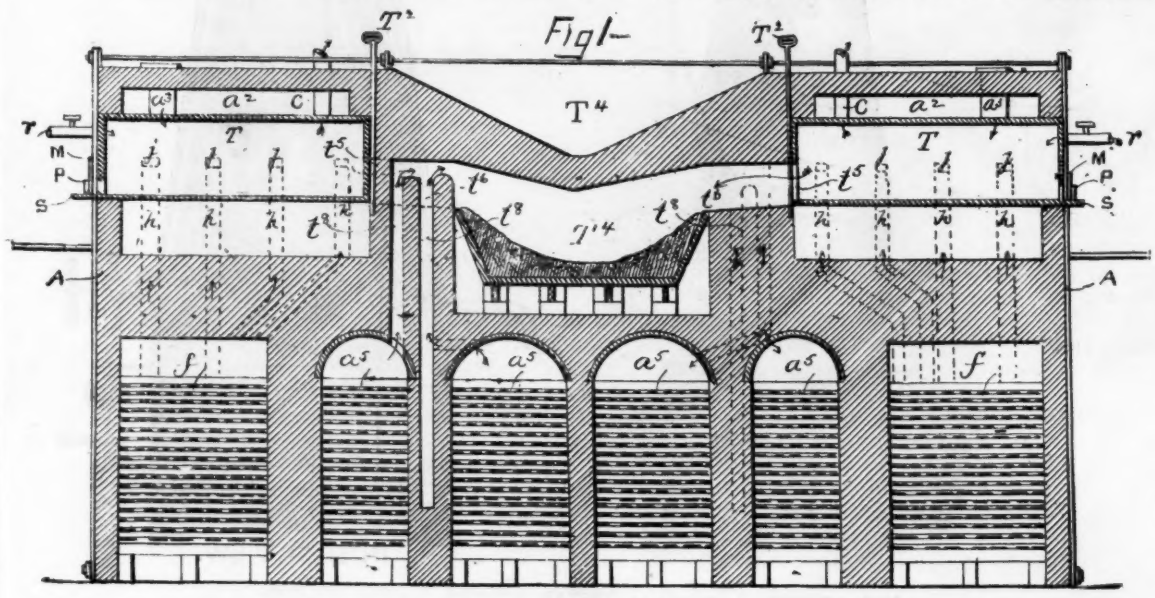
If the central open hearth furnace has a basic lining the process of eliminating the last traces of phosphorus is thereby shortened. The greater portion of of the phosphorus, however, is removed as phosphoric acid while in the deoxidizers at a temperature of from 600 to 800 degrees Fah., passing out through the exit pipe into the atmosphere. This means of purification is cheaper and more effective than that of solely relying on the basic process, as the very expensive basic lining will thereby only require renewing at much longer intervals. The purified and heated product is then passed into the *connected* open-hearth melting furnace where it is readily reduced to a melted condition and run off into ingot monlds and thence to the rolls or hammers for conversion into billets, bars, girders, boilers and other plates, rods, rails, etc. The enormous saving in cost of plant, labor and fuel, as well as in time, repairs, waste of carbon and materials by the adoption of the Conley-Lancaster direct process over that of the present blast furnace method of producing pig iron and thence its conversion into steel by means of the Bessemer, Siemens, or other convertors, cannot but suffice to mark its successful advancement as one of the most pronounced strides ever made in the iron and steel making industry.

A soft steel of uniform and excellent quality is produced directly from the ore at from $10 to $12 per ton less than steel can be made from the same ore by the Bessemer, Siemens (which require pig) or any other known process or plant; and by the consumption of less than 1,000 pounds of bituminous coal (converted into gas) to each ton of steel produced. The ordinary and existing open hearth furnaces can be cheaply and readily converted into the Conley-Lancaster system by attaching thereto, or mounting thereon, the deoxidizers and their necessary regenerative attachments. Before placing the ore in the deoxidizers, it is crushed and cleansed, either by passing the finely granulated ore through a magnetic ore separator, if magnetic, or by crushing and washing if a hematite or other class or non-magnetic ore is used.

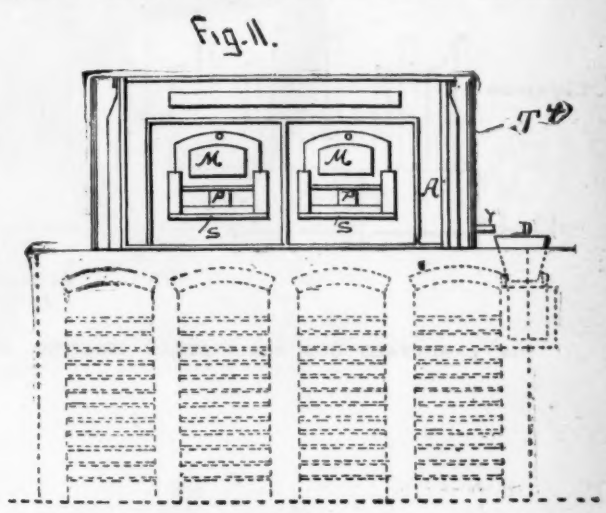
The Conley-Lancaster direct steel process plant, secured throughout the world by several strong and valid patents, are the joint inventions of Michael R. Conley and James H. Lancaster, who have devoted considerable time and attention to the perfection and development of this important innovation. Mr. Conley was for many years associated with Mr. Thos. A. Edison in developing the method of separating and cleansing magnetic ores by magnetic influence and subsequently co-operated and is still engaged with Mr. James H. Lancaster, of 171 Broadway, New York, the inventor of well known "Lancaster" rock and ore crushers and excavating and dredging machines, in the introduction of the now successfully demonstrated Conley-Lancaster process for producing steel direct from the ore.

With reference to the various illustrations relative to the Conley-Lancaster process described in this article, the indicating letters *T.* represent the deoxidizers which are surrounded by heating chambers a^2, the heat being supplied from the generators *f*. The central open hearth melting furnace T^4, is also heated by the same generators *f*. The deoxidizers are charged through the chutes a^3, a^3, with mixed ore and carbon in a pulverized condition, such being manipulated in the deoxidizers by a slice-bar inserted through the small sliding door *P*, of the muffle-door *M*. If the hydro-carbon gas is substituted for the pulverized carbon it is admitted through the pipe *r*. The impure gases resulting from the treatment and admixture of carbon and ore while in a heated state, pass off through the exit pipes *C*, *C*, which are extended through the roof of the building. When the ore has been reduced to a state of sponge the slides T^2, T^2, are raised, when the contents of the deoxidizers are transferred to the central melting furnace for final reduction. The melted lead is eventually tapped off through the spout *Y*, into the ladle car *D*, whence it is distributed into the ingot moulds.

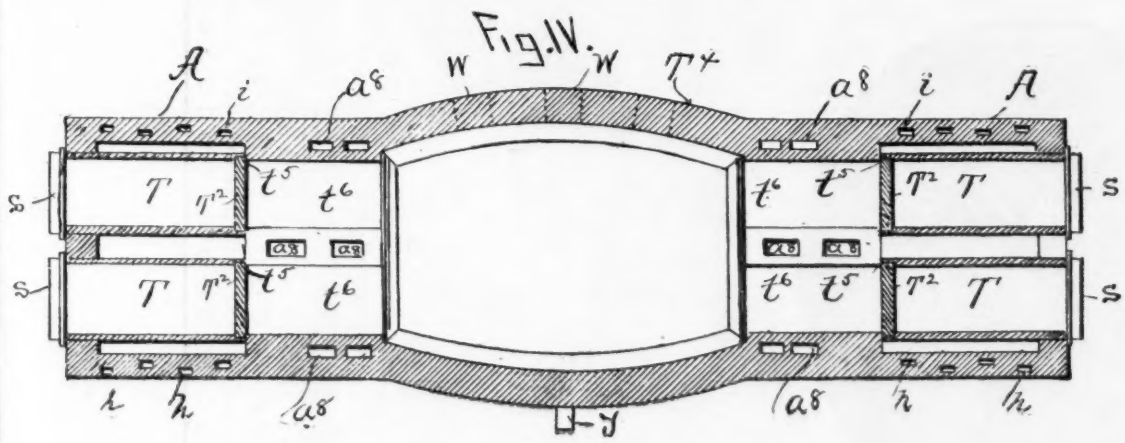
For further particulars and cost of plant and terms for the adoption of the process, application should be made to Mr. Lancaster, 171 Broadway, New York.—[Financial and Mining Record, New York, Nov. 22.



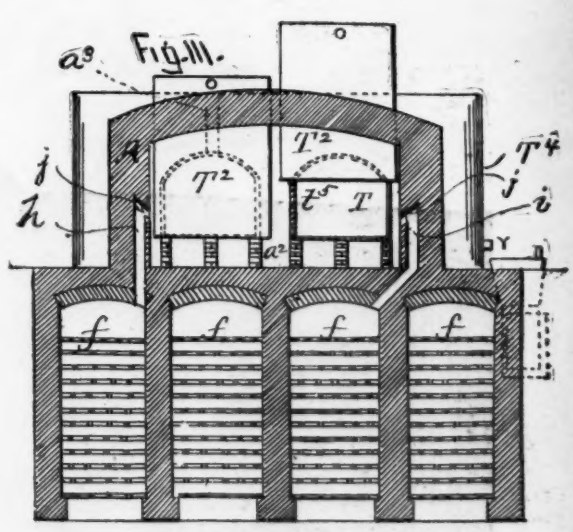
SECTIONAL VIEW.



FRONT VIEW.



PLAN VIEW.



CROSS SECTIONAL VIEW.

THE "CONLEY-LANCASTER" DIRECT STEEL PROCESS.

BUFFALO HOT BLAST STEAM HEATING APPARATUS.

[ILLUSTRATED.]

The necessity of a perfect system of heating and ventilation in factories and manufacturing establishments, which contain a large number of people employed the greater part of the day, is as great for the comfort and health of the inmates as in the most elegantly appointed office or other buildings. Actual experiments have repeatedly proven the fact that employees receiving the invigorating effect of a constant renewal of air will execute from 10 to 15 per cent. more work per day with a smaller percentage of absentees. Without discussion, it is safe to say that the large majority of buildings of this kind are heated with steam, this usually being taken from the same boiler which is used for generating the necessary steam for supplying power to run the machinery. All are familiar with the disadvantages of direct steam, either from radiators or from piping systems overhead or around the walls of the buildings. There is hammering in the steam pipes, damage resulting from leakage, the necessity of frequently repacking the valves, constant care and expense of keeping the entire system in order, the inconvenience of frequent regulation, the ever present danger of fire, and of freezing up of pipes. Add to this the imperfect distribution of heat, even in the most carefully planned outfits, resulting in the overheating of one portion, the underheating of another, and, above all, the cost of maintainence, and nothing further should be required to indicate its disadvantage.

In the Buffalo hot blast system, the entire quantity of radiating surface is massed together into manifold sections. differing in sizes and number, according to the number of cubic feet of air to be heated, the whole heating surface being encased in a steel plate jacket, and nothing but the best steel tubing used for the pipes in heater. Fresh air is taken in directly from the outside of building through a duct, and either forced or exhausted over the steam

pipes, from thence passing through conveying air pipes or ducts to different portions of the building. The distribution of the air is complete and entirely independent of all other conditions, so that a uniform temperature is thus secured in all parts of the building, both at floor and ceiling, without reference to outside temperature. It should be noted, in passing, that by concentrating the steam pipe, much greater duty is secured from any stated number of feet of pipe. Actual experiments have shown that one-fifth the amount of lineal feet of one-inch pipe, required to heat a given number of cubic feet of air by direct radiation, will give equally as much heat when arranged in the form of a hot blast heater and distributed by a fan to the different parts to be heated. In plain figures, 1,000 lineal feet of one-inch pipe in a hot blast box will give, generally, the results of 5,000 lineal feet of one-inch pipe strung around the building; and with the former, temperature and the distribution of air is complete, being uniform in all parts of the space heated. The comforts derived by a hot blast system do not end with fresh heated air, changed frequently in cold weather. In Summer, by simply turning off the steam from the heater, and then running the fan as usual, a constant circulation of fresh, cool air is maintained, and here, again, enables factory employes to do the work.

A unique feature of these new patented heaters is the complete control of the heating surface, either when using live or exhaust steam, or both. This is secured by a patented valve placed between each section, and shown in operation by Fig. 2. This valve is the exclusive property of the Buffalo Forge Co., Buffalo, N. Y., whose patented outfit is the one referred to herewith, the valve being specially designed by them for this work. The cages in which the valves are fitted are made suitable for the different sizes of manifolds, and are fitted to receive a brass nut, into which the valve stem screws. The valve, in itself, is made of such shape, and so put into position in the valve cage, that it is impossible for it to stick, leak or become obstructed so as to render its improper working. The valve stem and nut are of special composition, and are entirely free from corrosion or rusting. With using either live or exhaust steam alone, or both together, the valve remains perfectly tight. To prevent any leakage on outside of valve stem, the valve cage is provided with a stuffing box and nut between it and the handle, this being the only packing used in its construction. By the use of this valve, which is found in no other heater perfect control of the heating surface is afforded, as above referred to, so that when the weather requires but little heat, it is not necessary to run the whole number of sections. Fig. 1 shows the general appearance of the apparatus when blowing through heater. Fig. 2, ground plan of the heater. Fig. 3 shows end sections with patented valve between. Complete catalogue and blue prints, showing detailed application of this system to various buildings, will be furnished by the manufacturers, if addressed as above.

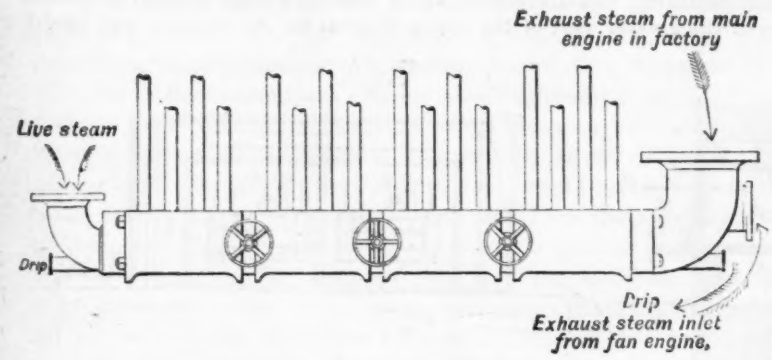
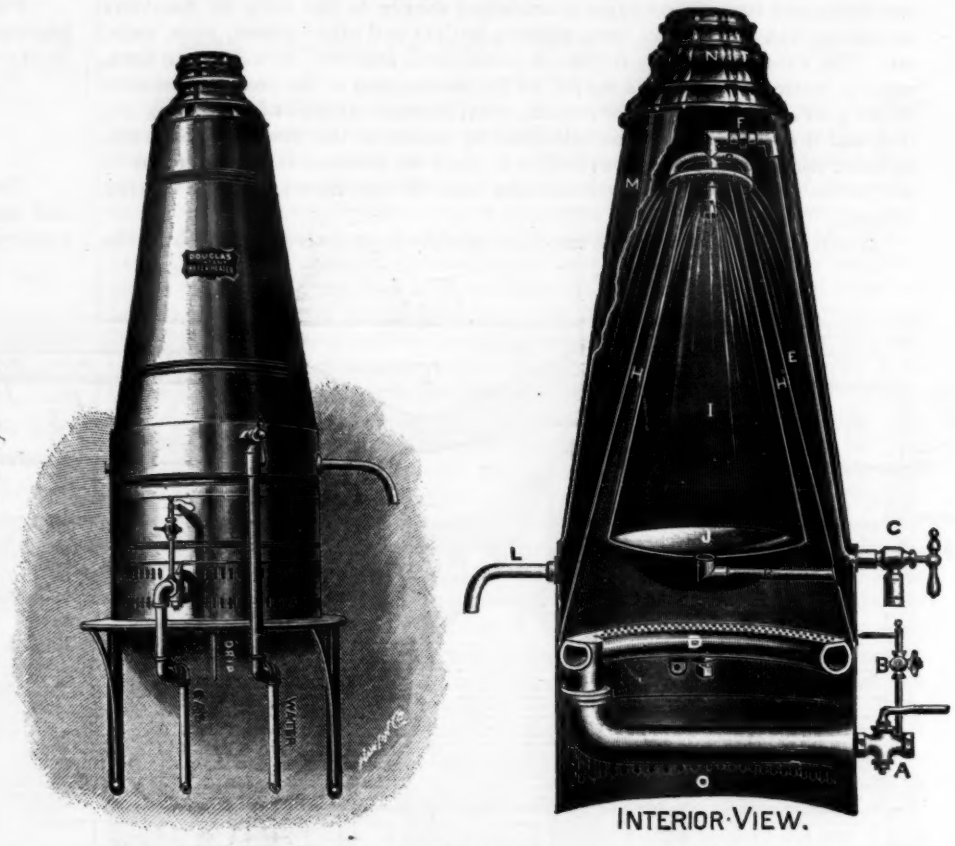


FIG. 3.—BUFFALO HOT BLAST STEAM HEATING APPARATUS.



THE IMPROVED DOUGLAS INSTANTANEOUS WATER HEATER.

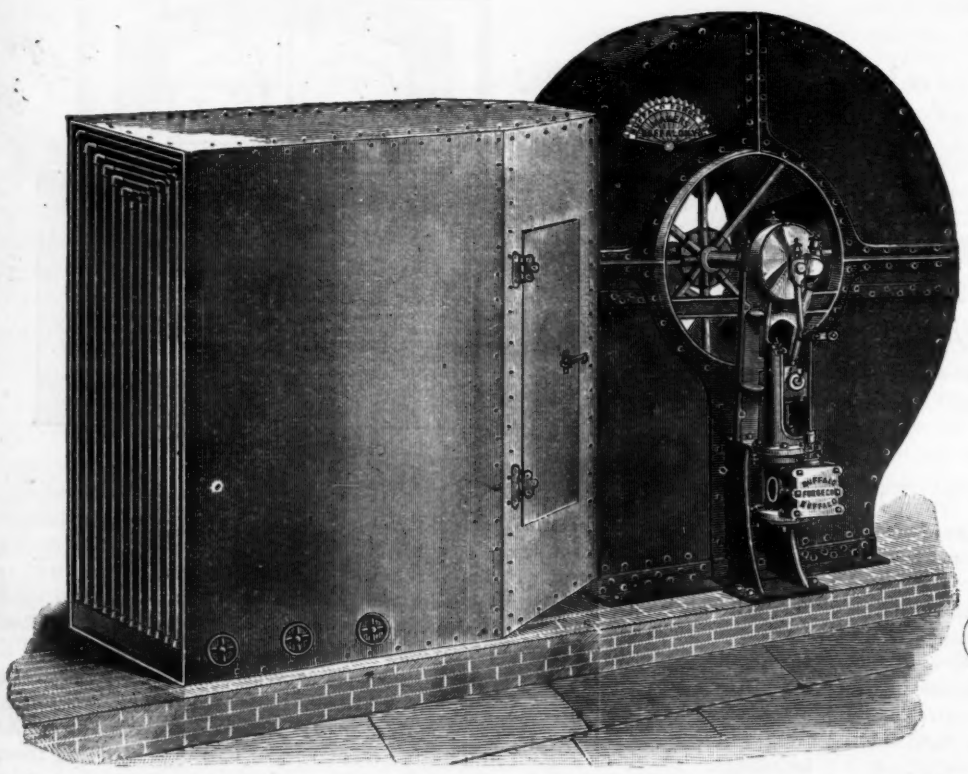


FIG. 1. BUFFALO HOT BLAST STEAM HEATING APPARATUS.

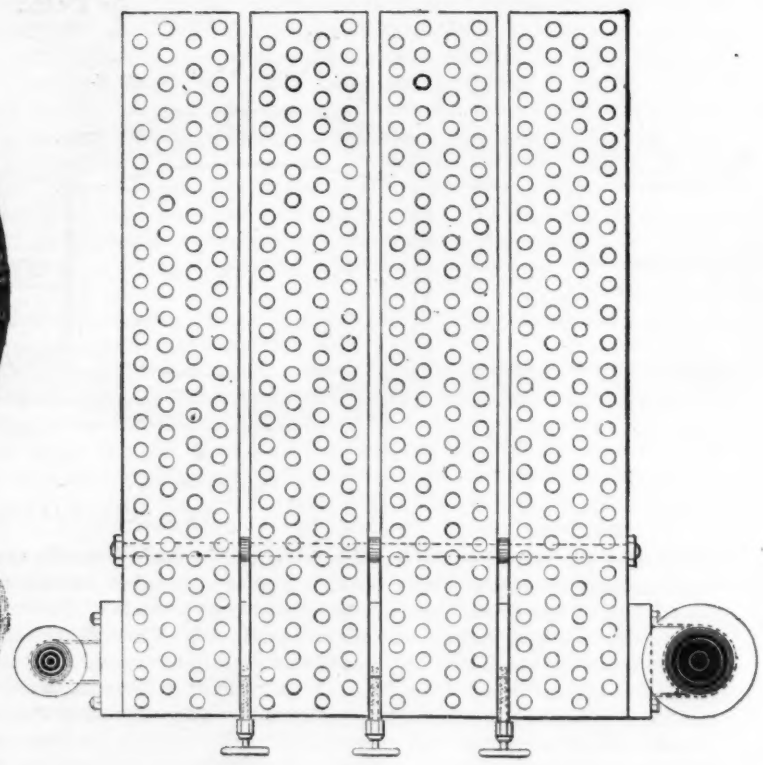


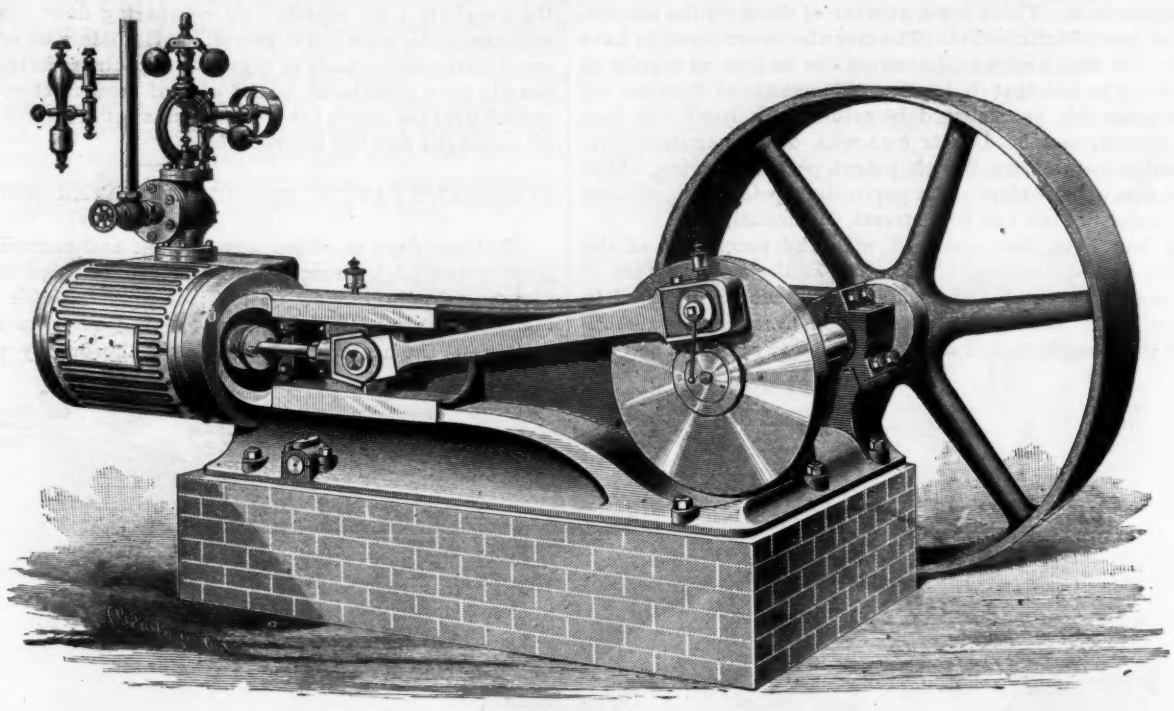
FIG. 2.

THE IMPROVED DOUGLAS INSTANTANEOUS WATER HEATER.

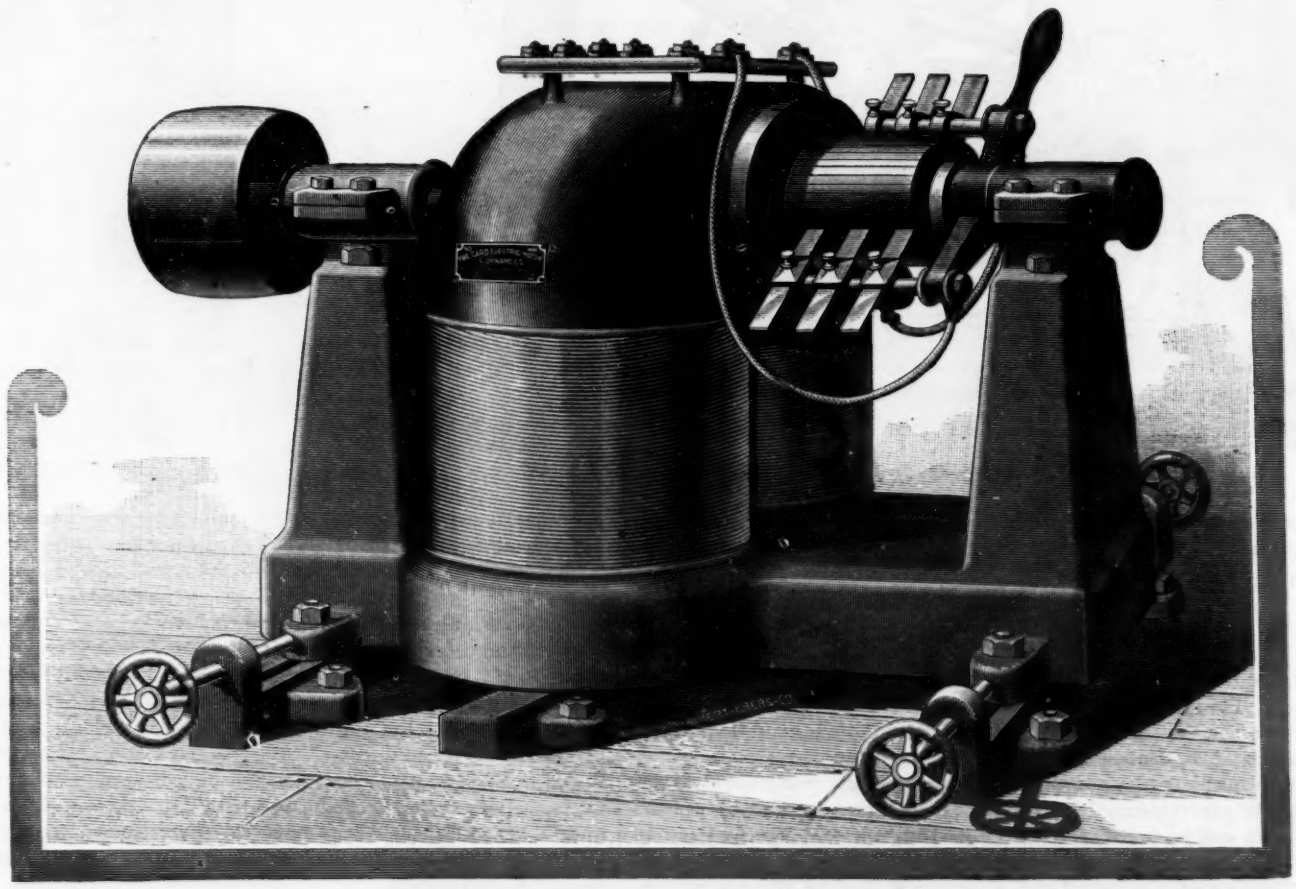
[ILLUSTRATED.]

The Instantaneous Water Heating Co., 210 Illinois St., Chicago, announce still further improvements in their No. 2 Douglas instantaneous water heater, which we here illustrate, and which the company claim to be more effective than any heater they have made. The heating surface has been largely in-

creased and the operations still more simplified, which is sure to increase its already large demand. Great care has been exercised in the construction of this heater, and with the aid of their long experience they have been enabled to overcome all objections in using water containing lime, magnesia, etc. This heater is adapted for all kinds of gas, and arranged to supply both bath and basin. While the cost of the manufacture has been increased, the trade is informed that the prices will remains the same. The operation is as follows: After lighting pilot C, the gas supplying burner D is turned on at gas cock C, which passes upward through pipe E, and into double spray G, then discharging in spray form on the outside of cylinder H and on the inside of cylinder I, the water from cylinder I discharging through pipe K and mixing with the water passing over cylinder H and passing out at spout L. The flame from burner D passes upward through the annular space between copper cylinder H and I, and in doing so, comes in direct contact with every part of the heating surface. The water can be regulated to any temperature by opening or closing supply cock C. Further information will be cheerfully given by addressing the manufacturers.



A NEW SELF-CONTAINED ENGINE.



THE CARD ELECTRIC MOTOR & DYNAMO COMPANY.

THE CARD ELECTRIC MOTOR & DYNAMO COMPANY.

[ILLUSTRATED.]

We illustrate herewith, the type adopted by the Card Electric Motor & Dynamo Co., Cincinnati, O., for their motors from 8 to 30 H. P., or dynamos from 100 to 350 lights. The general type of the motor, it will be seen, is that which has been conceded by electrical experts to be the most efficient and economical. The fields are oval in shape, thus enabling the manufacturer to use all the iron and wire that are necessary for the proper proportion for highest efficiency of the motor or dynamo without raising the armature to such a height as to weaken the bearings. It will also be noticed that the base and upright pieces for the bearings, are made in one solid casting, thus giving great strength where most required. The bearings are self-oiling, the pole-pieces and head are one solid forging. The above company have endeavored to profit by the experience of their competitors in this line, and think they have perfected a simple, compact and durable machine. The fact that this company are moving this month into new and more commodious quarters is sufficient evidence of the popularity of their goods wherever they are known. They are manufacturing a full line of all sizes of motors and dynamos, and solicit correspondence with people in need of anything in that line.

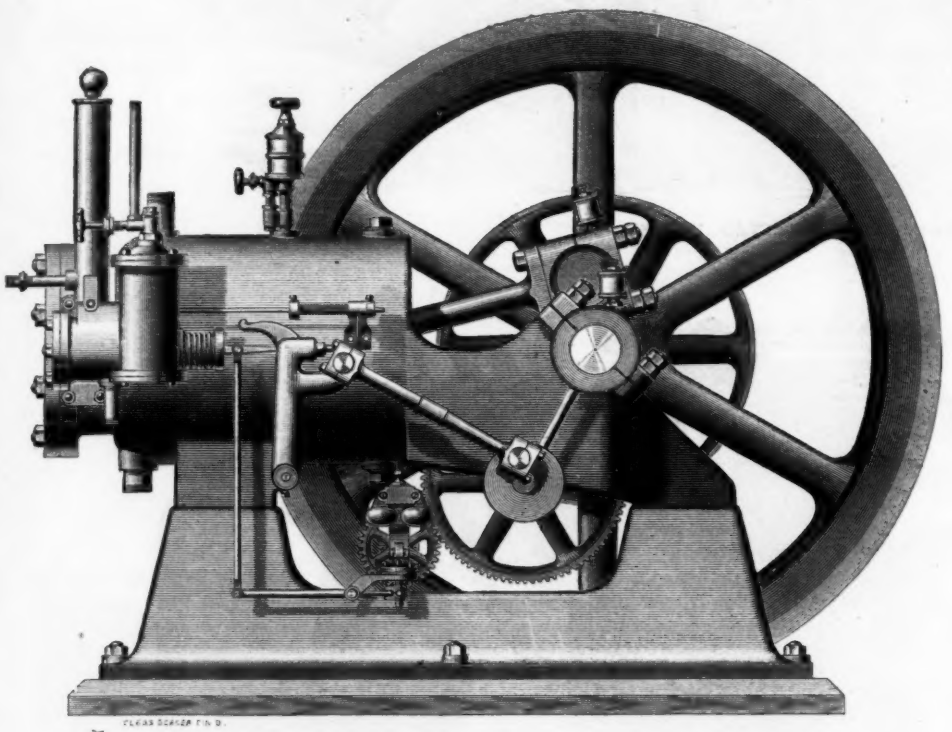
A NEW SELF-CONTAINED ENGINE.

[ILLUSTRATED.]

The accompanying cut shows an engine of new design which the manufacturers intend to place on the market at a reasonable figure, in all sizes. The frame is one of the self-contained patterns, having, it is claimed, great advantages over other engines of the same class sold at about the same price, in being so made that the driving pulley can be worked either between the bearing or overhung, whichever the purchaser sees fit to order. The cut shows it with the overhung pulley. The advantages of having the boxes both cast on one bed are well known to all users of the steam engine. The engine

is always in line and it does not require a man of experience to set it in position. The advantage of having the pulley between the bearings is also known. It equalizes the strain and permits of the engine being used to a higher speed and a greater development of power than would be possible on one with an overhung pulley. Another advantage this engine is claimed to possess over most of the others that have the overhung cylinder, is in having two distinct cylinder heads. The ordinary run of engines are made with the stuffing box attached, cast to the main frame of the engine. This makes it difficult to have repairs made, and, in event of the stuffing box getting out of order from breakage or otherwise, it necessitates a very bad piece of patchwork or the getting of an entire new bed plate. The engine is heavy and well made, being designed in good proportions. There are a number of them on the market. and they are giving the best of satisfaction. The manufacturers claim to have made their list prices low with a view to introduce the engine as rapidly as possible on the market. The fact that their sales will amount to between 250 and 300 boilers and engines this year, should be evidence in itself that they are in the market to compete and hold their own with other manufacturers, They call particular attention to their Scotch patent portable engine, which has been illustrated in this paper before. For particulars, prices, etc., address D. K. Norton & Son, corner Second and Elm streets, Cincinnati, O.

Messrs. Norton & Son have just arranged with the successors of the Blymyer Manufacturing Co., of Cincinnati, to dispose of their entire stock of boilers and engines, both completed and uncompleted, amounting in all to about 50, from 10 to 150 H. P. They will be in position to make very reasonable figures on any of these engines, and will be pleased to send cut and full particulars of any size wanted. The reputation of their engines is second to none on the market, they being particularly heavy and workmanship of the best.



VAN DUZEN GASOLINE ENGINE.

GASOLINE ENGINES.

[ILLUSTRATED]

The gas engine is adapted for stationary use only, and can be used only in cities having gas. Therefore, the demand has been for a motor of some kind which could be used in the small towns and country. This long felt want has been secured by the Van Duzen Gas & Gasoline Engine Co, Cincinnati, O. Although they are builders of a gas engine which contains many superior advantages over other gas engines, they did not allow themselves to be carried along in the old rut and be satisfied with the gas engine only, and started to experiment on a gasoline engine, the result of which will be seen by the accompanying cut. This is a very compact and economical engine, the cost of running being about one cent per hour per horse-power, on a basis of ten cents per gallon for gasoline of 74 test. It is the same as their gas engine in every respect, with the addition of a carburetter, which does not take up any extra floor space, as it is attached to the air pipe, and extends not more than six to eight inches from the cylinder off to one side.

The tank supplying the gasoline is usually placed outside the building. The carburetter is connected direct to, and is under the complete control of the governor, and only makes the gas as it is called upon by the governor, and all the gas is consumed as it is made. By this simple yet positive arrangement they complely overcome the possibility of any escapement of the gaseous mixture; hence, there is no smell, danger of fire, or an explosion, the gasoline supply being completely shut off.

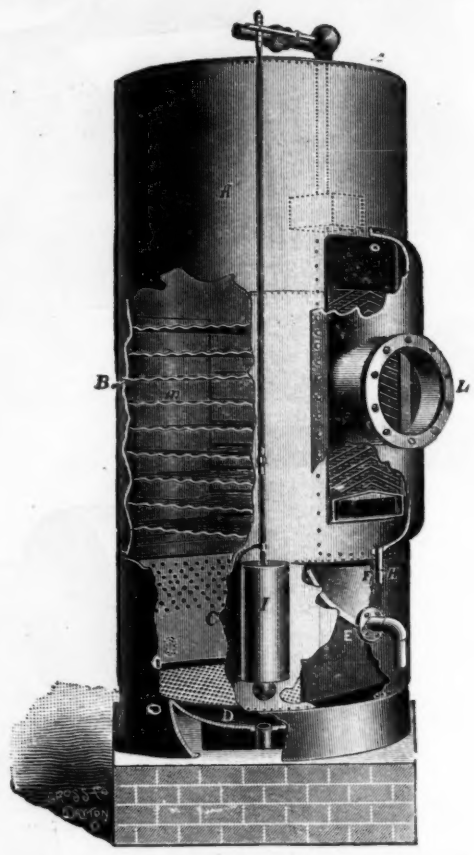
This engine is used in the cities, and towns, for running elevators, elevating water for hotels, operating electric plants, or any other use to which an engine can be put. In many instances parties have the gasoline attachment put on when they do not intend running with it continuously, but should anything happen that they cannot get the gas, they can fill the gasoline tank and go right ahead, thereby preventing a delay that is in most cases very costly.

They have just completed the most compact gasoline engine ever constructed. It is of the upright type, the balance wheels and crank-shaft resting on the base, to which the pillar blocks are also cast, making all one casting. The cylinder is supported by four steel standards which also hold the journals for the gear-wheel shaft operating the valves and governor. The speed is 250 revolutions per minute, and it develops 16 horse-power, using only about four buckets of water for a run of ten hours. The amount of gasoline used, varies according to the load on the engine. The floor space is reduced one-half that required by other gas or gasoline engines, being four feet by four feet, and the weight is 2,500 pounds. By comparing floor space and weight of other engines of the same horse-power, it will plainly be seen that there has been a vast improvement made as regards compactness in this class engine, which has usually been prominent in the eyes of mechanics as being an excess of iron spread over too much space for the amount of power produced. Write them for catalogue and full information.

STILWELL'S PATENT IMPROVED HEATER AND FILTER COMBINED.

[ILLUSTRATED]

In these days of sharp competition and reduced profits, no steam power plant using high pressure engines can be regarded as complete, from an economical point of view, unless it is provided with an efficient heater utilizing the exhaust steam for heating the feed water for the boilers; and if, at the same time, the heater can be made to thoroughly purify the water so as to prevent the formatiou of scale in the boilers, its economical value is thereby greatly augmented. In the Stilwell patent improved heater, herewith illustrated, its manufacturers claim to offer just such a device, and they further claim to have successfully met all the objections hitherto urged against open heaters. Briefly stated, the following advantages are claimed:- 1. Very large heating and filtering capacity, and also depositing surfaces, for receiving the deposits of lime and other impurities. 2. Increased facilities for quickly and thoroughly cleaning the heater. 3. Effectual devices for separating and catching the cylinder oil contained in the exhaust steam. 4. Automatic regulation of the inflow of cold water, thus insuring an even and steady feed. A finely illustrated descriptive catalogue can be had upon application to the manufacturers, Stilwell & Bierce Manufacturing Co., Dayton, O, who for more than a quarter of a century have made a specialty of machinery for heating and purifying feed water for steam boilers, a fact which entitles their claims to careful consideration.



STILWELL'S PATENT HEATER AND FILTER COMBINED.

DODGE'S BOILER COMPOUNDS.

C. D. Dodge, manufacturer of boiler compounds, Lansing, Mich., writes us as follows:—In bringing the Dodge boiler appliances before the public, I do so after carefully investigating many of the other boiler cleaners now in use, either by my own personal observation, or by inquiring directly of the men who have used them, and as practical engineers are competent to judge of their worth. I find quite a number which are doing fairly well, while others are practically worthless, and in most cases their use has been discontinued. In some cases it is the fault of the engineers, who allow them to fill up with mud, and do not try to keep them clean, but in most cases it is the fault of the cleaners, because of the way they are constructed. Being an engineer of 20 years' experience, I can speak from a personal knowledge of what I know to be a fact. In order to have a boiler cleaner work successfully, the skimmer must be as much as possible, if not entirely on the water surface, in order to collect the sediment and dirt as it comes to the top while the water is in agi-

tation, as it is when the steam is up, and the boiler in use. It is very seldom that you find engineers who keep the water in the boiler at one point all the time. Sometimes they have one guage and sometimes three. It is impossible to attend to their other work and keep the water always at just such a level. All other skimmers are arranged stationary, to be on the water level at one and a half or two guages, and it is a common occurrence for them to be wholly submerged or entirely above the water, in either case being utterly useless. I think any practical engineer will see where I have the advantage over all other boiler cleaners, as with my double floats and ball joints, my cleaner is on the water surface at all times, no matter what the height of the water in the boiler, if it is above the flues. It is also arranged that the return pipe is discharging the return water from the rear of the boiler back toward the fire or front of the boiler, thus keeping the circulation upward and toward the mouth of the funnels where all the scum and filth are taken up by the syphonic action and carried into a mud drum, where they settte and are blown off. We also have a galvanic battery attachment in connection with our boiler cleaner, for loosening up the old scale. All owners and managers who are anxious to curtail expenses, and engineers who wish to save lots of hard work and establish a reputation for economy, should use our boiler cleaners. It is a well-established fact that a very thin coat of scale will require from ¼ to ⅓ more fuel, as scale is a non-conductor of heat. More attention should be given to the boilers if you wish to reduce the yearly expenses for fuel and repairs. Many boilers are weakened or started to leaking by using compounds for cleaning, all of which contain more or less acid, which will eat into the boiler and flues, and soon start them to leaking at the seams."

POST & CO., CINCINNATI.

[ILLUSTRATED.]

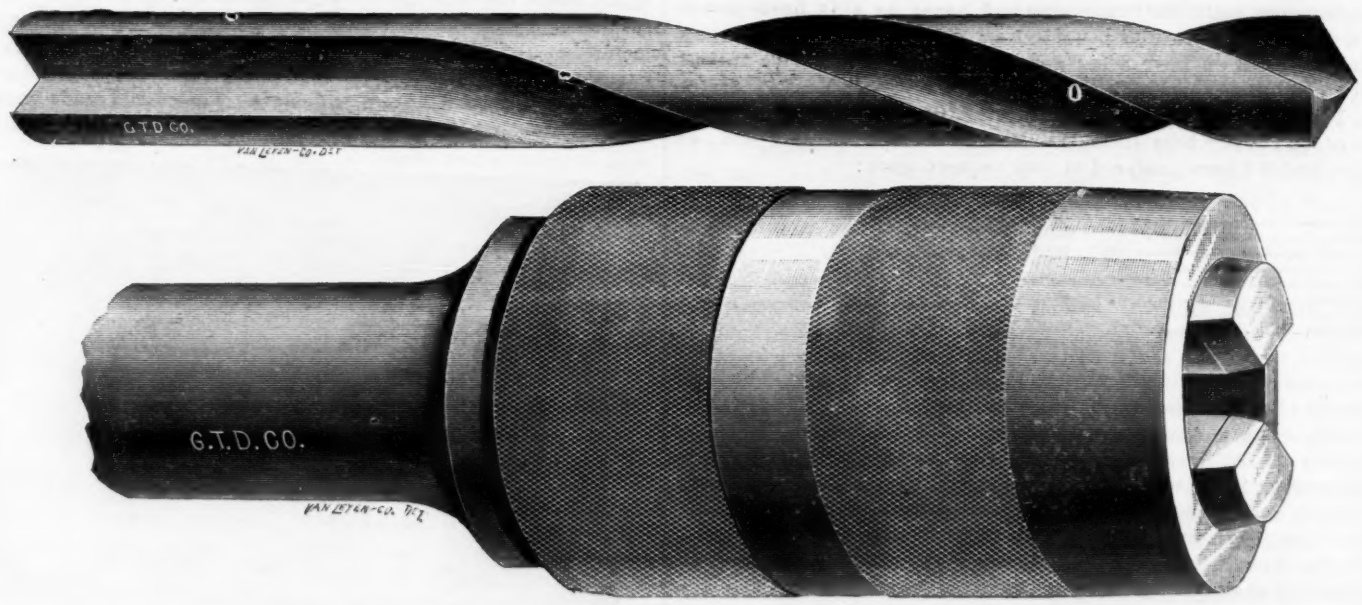
The very beautiful design herewith illustrated, will call attention to the prominent and well known firm of Post & Co., 217 West Fourth St., Cincinnati, O. This firm started in business in 1863, and from small beginnings has grown to its present large proportions, and is increasing all the time. Their trade covers all sections of this country and also extends into many portions of foreign countries. They manufacture a great variety of all styles of lamps in brass and other metals, locks, basket racks, door, window seat and berth fixtures, buffet and vestibule trimmings for coach, private, sleeping, mail, parlor, bufiet-vestibule cars and caboose cars: also manufacture lamps, locks, trimmings and various other articles for electric, cable and horse cars, power house and line supplies; also head-lights for locomotives, steamboats, steam, electric, cable, horse cars, bridging harbor, switch, street and mill lamps; also various styles of student, bracket and other lamps and lamps for carriage and stable use. Other specialties embrace a great variety of trimmings for carriages and omnibuses, harnesses and brass, nickel and other metals and a large line of articles for refrigerators and counter hardware stores; also fixtures for store, office and bank fixture departments. They also manufacture conductors' punches, patent automatic syphon, patent bank protector, gas extinguisher, apple-core slicer and cork-screw, door check, electric street shade and engineers' torches and keep on hand a large supply of lamp trimmings and a large variety in the merchandise department, sheet moldings, sheet springs, brass and copper tubing, all shades of lamp globes, water coolers, wash stands, steam guages, switch and berth chain, safety chain and seat beaters, marble slabs and many other articles too numerous to mention.

NEW DESIGNS FOR LAMPS, ETC.

A NEW TWIST DRILL.

[ILLUSTRATED.]

Without departing from the well established principles on which these useful tools have been manufactured for the past 20 odd years, the Graham Twist Drill Co., of Detroit, Mich., is now placing on the market a new drill which is receiving the endorsement of progressive mechanics wherever introduced, and which strikes us as being posessed of great merit. The flute or pod of the drill is of the well-known straight lip increase twist pattern—the shank of the drill is where the novelty comes in. Instead of adopting the straight round shank to be fastened by a set screw, or held in the expensive or complicated automatic chucks used for that purpose, or the taper shank which, though most largely used heretofore, is open to many objections, the Graham Co. has adopted a device which, it is claimed, is the very acme of simplicity convenience and efficiency.



A NEW TWIST DRILL.

Briefly described, it is this: The double flute or groove of the drill is carried from where the twist ceases to the end of the shank, forming a parallel V-shaped groove on opposite sides of the shank, which grooves are utilized to hold the tool firmly in the patent chucks which accompany the set of drills. The web or bottom of this V-shaped groove is made of the same thickness in all drills, from ¼ inch to ¾ inch, and in all drills above ¾ inch the web is again of the same dimensions. The angle of the groove, however, does not vary. The effect of this arrangement is that all drills from ¼ inch to ¾ inch are accommodated in one chuck (No. 1), and all sizes above in the other (No. 2) two chucks, thus covering the full range of sizes. The principles of these chucks can be seen at a glance by the accompanying illustrations. The solid jaws fit into the shank grooves, a simple turn of the outside shell clamps them firmly, centering the tool and holding it securely in position. A turn backwards releases the drill instantly, but no wrench, drift or hammer being required. The chuck shanks are furnished plain, ready to fit to any drill spindle. It would

seem that these chucks should be practically indestructible. Certainly no simpler or more effective arrangement could be devised.

The Graham Co. lay geat stress upon the fact that on account of the new form of their drill they are able to make a better application of the rolling and hot forging processes in the manufacture of their goods than is possible with the old style drills. Their drills are made by an ingenious combination of these two systems which, on account of the thorough working, refining and compacting which the steel receives, especially in the center, where the wear and strain is the greatest, a tool is produced which will cut faster and wear longer than any drill now offered to customers. Judging from the testimonials and records of tests, these claims for superiority seem to be well founded, and we predict a speedy adoption of the Graham drill by all progressive mechanics, and a flourishing business for the Graham Twist Drill Co.

EUREKA TEMPERED COPPER CO.

The product of the Eureka Tempered Copper Co., of North East, Pa., presents to the trade a new and novel innovation. It consists of tempered or hardened copper or hardened aluminum, in any shape for the trade, to be used for bearings of all kinds and electrical work, guaranteed to be pure, without alloys, and hardened by their peculiar process. They claim as a bearing metal that, if properly fitted and cared for, it will run cold and show little or no wear for years, and require no Babbitt or loss of time to refit the same. They guarantee three times the wear of any bronze, brass, copper or other metal used for this purpose. For electrical work, they stand alone in being able to furnish pure copper of high conductivity, cast solid, without blowholes. To this they add the tempering or hardening process, and thereby increase its durability for commutators, gear or armature pinions, trollies, etc. They have on exhibition at their office, commutators that have run upwards of six months under a hard brush, and the wear is hardly perceptible. They also show a set of Western brushes made from their metal that ran 111 nights and were not nearly worn out. The Brush Electric Light Co., of this city, are large users of their goods, and a price list lately offered to the trade indicates that this company finish up and supply Brush central stations, as well as several other electrical systems, with finished segments and brushes.

The fact that this new company, starting with the year 1890, received 184 orders in the month of September alone, and have lately been compelled to double their capacity, both in building and number of employes, bespeaks a great future for their trade, and would indicate that they have all they claim.

Out of numerous testimonials we select the following:

From E. W. Davis, Supt. Pittsburgh Traction Co.:—"I have great pleasure in being able to testify to to the excellent quality of your tempered copper. We have been using a guide show made of it on a 500 horse-power Corliss engine for the past six months. It looks as well to-day as when we put it on. We are also using your metal for connecting rod boxes on a 35 horse-power Ball engine, making 300 revolutions per minute. We find it takes much less oil than any other metal we have seen, and runs much cooler. We intend equipping all our other engines with your tempered copper."

From Dr. F. A. Genth, chemist, to Franklin Institute, Philadelphia, Pa.:—"The samples of the copper bars from the Eureka Temper Copper Co., of North East, Pa., which I have analyzed at your request, gave:

	No. 1—Not Tempered.	No. 2—Tempered.
Silver	0.026	0.025
Copper	99.930	99.981
Tin	none	none
Zinc	none	none
Iron	0.082	0.088
Aluminum	none	none
Arsenic	0.046	0.042
Phosphorus	0.017	0.018
	101.101	100.000

"The analyses are almost identical, and do not look as if any chemicals had been added in the previous process of tempering."

From Wm. M. Ramsey, Assistant Superintendent Federal Street & Pleasant Valley Railway Co, Allegheny City, Pa.:—"In reply to your inquiry concerning our experience with tempered copper, would say that after a year's use, we can heartily endorse and recommend it for all descriptions of bearings and for electrical purposes, such as commutator bars, trolly wheels, etc."

From J. H. McEwen, Manager J. H. McEwen & Co., Ridgway, Pa.:—"In reply to your inquiry about the working of the large boxes sent us, nearly a year ago, will say that the boxes were used for journal boxes for a large crusher, and have been in constant use for nearly a year, crushing about sixty cords of hemlock bark every ten hours. They are running cool, and show very little wear. Before we commenced the use of tempered copper we used brass and genuine babbitt, but were bothered greatly by the heating of the journal, owing to the great pressnre. With your boxes we have no trouble of this kind. It is the best metal we have ever used for journal boxes working under great pressure."

From C. R. Huntley, General Manager Brush Electric Light Co., Buffalo, N. Y.:—"Some time, about eight months ago, we began the use of tempered copper for commutator segments on the Brush machine, and we have had remarkable success with its use. We find that they wear about three times as long as ordinary segments made of copper. We have tried the experiment of using tempered copper for brushes, and beg leave to report the result: The 1st of March we put a set of brushes on a dynamo and they were not trimmed until the 17th of April. This is a remarkable showing and you may count upon us as staunch advocates and constant users of tempered copper in this line of our business."

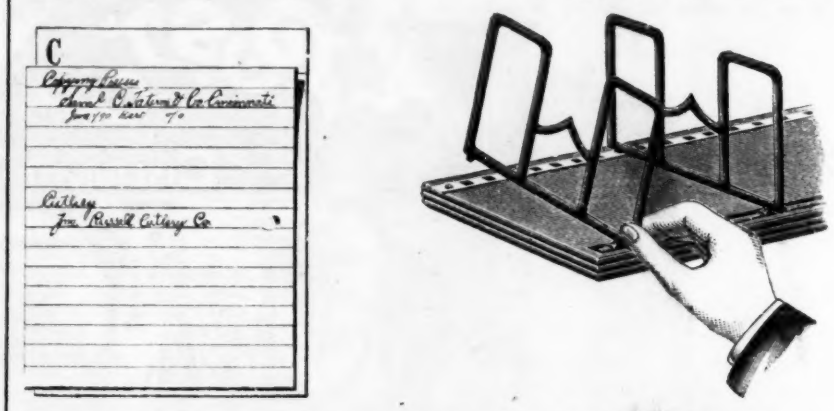
TAPLIN, RICE & CO.

One of the oldest and staunchest manufacturing concerns in Ohio is that of Taplin, Rice & Co., of Akron, O. For more than 45 years the senior member of the firm has been in active business, yet, despite his long service, he still keeps abreast of the times, being ably surrounded by a corps of intelligent and pushing associates. Besides their stove business, which has reached literally a world-wide reputation, they manufacture engines, milling machines, cutter and reamer grinders, saw and grist mill machinery, shears, punches, coal bank machinery, building and bridge castings and wrought iron work of every description. It is seldom, indeed, that so many departments of production are combined under a single management, and it is still more remarkable that Taplin, Rice & Co. should have achieved such marked distinction for the superior character of their varied lines of manufactures. Their plant is comprised in a group of massive buildings, covering an extensive area and completely equipped with the most modern machinery in all departments. In brief, their facilities are what might be expected of a house that has acquired a national reputation in several lines of industry, calling for the largest sources in each. They furnish employment to several hundred well paid mechanics, and few concerns have so prominently contributed to the prosperity of the busy city of Akron.

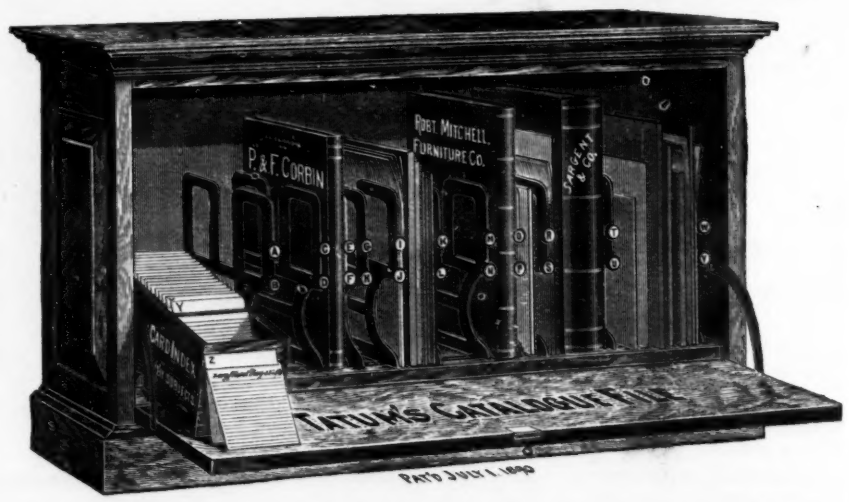
TATUM'S CATALOGUE FILE.

[ILLUSTRATED.]

Samuel C. Tatum & Co., corner John and Water Streets, Cincinnati, O., manufacture a catalogue file, as shown in Fig. 1. This is finished in antique oak, the front being carved, making a handsome and attractive piece of office furniture. It is 20 inches high, 32½ inches long and 14½ inches wide. Larger sizes are also made, being the same dimensions except twice or three times as high, consequently having twice or three times the capacity. The iron parti-



tions, of which there may be as many as the letters of the alphabet, slide over a rod at the nearest lower corner, and opposite (toward the back) engage at intervals in a perforated strip let into the upper face of the bottom board, upon which board the catalogues rest, as shown in Fig. 2. It is easy to adjust the distance between the partitions for any size of books or papers without removing or disturbing the materials already filed. The index letters on the partitions are intended for ready distribution of the material according to the names of the manufacturers or dealers. The case is made quite tight to keep out the dust. For index of subjects the card index is used, with a convenient



drawer to hold the index cards. The "finder cards" are taller than the others and have the letters on them alphabetically arranged, as in Fig. 3. Discounts of matters relating to the same articles may be entered on the same card. Thus the merchant or manufacturer may have a ready index capable of indefinite development, embracing all catalogues in a compact and accessible shape. He can have before him all the information a buyer needs, as to prices previously quoted, be it the day before or some months since.

THE SILSBY MANUFACTURING CO.

Wherever fire apparatus is found, the name of the Silsby Manufacturing Co., of Seneca Falls, N. Y., is favorably known. In substantial construction, high efficiency, and handsome finish their rotary steam fire engines have long held the front rank. A recent visit to their extensive works revealed the secret of the superiority of their work. Perfect system prevails everywhere. The highest class of workmanship is required, and rigid inspection detects and corrects all faulty construction. The works have a frontage of 416 feet on the Seneca River, 366 feet on Dey's race, a depth of 363 feet, and an L with a frontage of 44 feet on Fell street. From offices to finishing room everything betokened intelligence, enterprise, thrift. The officers of the company are, H. C. Silsby, President; Hiram Silsby, Vice-President; William Silsby, Secretary, and Charles T. Silsby, Treasurer. Their product consists not only of

steam fire engines, but bronze and iron pumps for various purposes, fire department supplies, etc.

MILLETT'S PATENT CORE OVEN.

The Millett Patent Core Oven Co., Brightwood, Mass., are making a core oven that is attracting wide attention. A cut of the same appears in their advertisement elsewhere in this issue. The best endorsement of this oven is a list of those who are using it. Among others are Westinghouse Air Brake Co., Pittsburgh, Pa.; Edison Machine Works, Schenectady, N. Y.; Brooks Locomotive Works, Dunkirk, N. Y.; Fuller Iron Works, Providence, R. I; J. L. Mott Iron Works, New York; D. A. Hopkins Mfg. Co., 113 Liberty St., N. Y.; Miller's Falls Co., Millers Falls, Mass.; Star Brass Co., 53 Oliver St., Boston, Mass.; Davenport & Fairbain, Erie, Pa.; Hancock Inspirator Co., Boston, Mass. The Westinghouse Co. say of these ovens: "They give perfect satisfaction in every particular. We consider them the most convenient and effective device of the kind we have ever seen."

THE AKRON BELTING CO.

One of Akron's growing and enterprising manufacturing concerns is the Akron Belting Co. The officers of the company are all well known citizens, viz.: G. W. Crouse, President; A. M. Barber, Vice-President; Webster Thorp, Superintendent; Sumner Nash, Secretary and Treasurer. The product of this company is rapidly securing a reputation all over the country, and its order book shows the names of many of the largest concerns in the east and west.

PROSPECTS OF TINPLATE MANUFACTURE IN THIS COUNTRY.

SPECIAL CORRESPONDENCE.]

Much speculation has been rife here as to the effect of the election on the many proposed tinplate manufacturing plants, and the prediction has been freely made that the result would practically kill the industry, while more sanguine ones have said that, while the industry might not be dead yet, the blow struck it by the election was such a staggering one that it would be a long time before much would be done toward putting this promised industry on its feet. Inquiry among those that are in a position to know the facts in the case, develops the fact that neither of these predictions is correct. The industry is not dead; in fact, it is exceedingly alive, and preparations for the establishing of tinplate mills are being pushed forward vigorously, as are also the experiments that are being made to improve the methods of handling the tin in the dipping department. I am credibly informed that so successful have these experiments been, that dipping is being done now by the aid of machinery, which enables them to get greater results with two operatives than was formerly possible with six. Said a prominent operator to me, to-day: "You can say for me that tinplate can and will be made in this country, and some of it in this section." Contracts were let this week for three black plate mills, to be built at once. Another firm has just completed the plans and specifications for four complete tin works, and has the best assurance that at least two of them will be built at once. A private letter shown me to-day gives the information that two large tinplate manufacturers of Wales have sold their plant, and are going to establish themselves in this country as soon as they can make the necessary arrangements.

Mr. W. C. Cronnemeyer, Secretary of the United States Tinned Plate Association, very reluctantly consented to give a few facts for publication. In substance, he said that at the time the tariff bill passed there was a company formed with a capital of $500,000 in cash, for the purpose of entering into the manufacture of tinplate in this vicinity, but that the result of the election was to temporarily stop further proceedings, and nothing more had been done by this company, and probably would not be until matters were in a more settled condition. He was of the opinion, however, that the result of the election would be only temporary, the outcome depending somewhat on the course of next Congress, but that there would be tinplate made here was a settled fact, the question remaining to decide being the extent the manufacture would be entered into.

"The Free Trade papers," said he, "like the *American Artisan*, say that we ought to go ahead with the tinplate plants that were contemplated, but in the same breath say that the tariff bill will be repealed. What sane man would rush into a business with so much uncertainty connected with it? There will have to be some settled policy established to be depended upon, at least for a length of time sufficient to get mills into operation, for capitalists to invest their money." In reply to the question as to whether the present price of tinplate would justify manufacturers entering into the business, provided these prices could be depended on, that is, at the present prices whether we would be able to compete successfully with tin from Wales, provided we could get satisfactory foot-hold in the market, Mr. Cronnemeyer replied that we certainly could if prices remained as they are now, but at the prices as they were before the tariff bill passed, American manufacturers would be at the mercy of the importers, who would drive them out of the market, as they did with their intrigues 15 years ago. At the same time, the United States Iron & Tin Plate Co. is going ahead with the reconstruction of its old plant, and by the middle of the Summer will be making tinplates. In reply to the question as to whether enough advancement had been or probably would be made in the improved methods of manufacture, whereby the cost of manufacturing would be reduced enough so that American manufacturers would be able to compete with the Wales manufacturers if the duty were removed later on; that is, after the industry was well established, the reply was: "There have already been some improvements made whereby the cost of manufacture is greatly reduced, and there undoubtedly will be more improved methods adopted, and the result can be nothing less than the reduction in price of tinplates to a point as low as they were before the tariff bill was passed, though it might take some time to reach this point." From the best information I could secure, the improved methods that have been adopted so far have not proven altogether a success. While they have reduced the cost of dipping, yet the quality and standard have also suffered. Nothing has yet been found to take the place of hand-dipping and the use of palm oil and tallow, and this is the method that will be adopted by associations with which Mr. Cronnemeyer is connected. Mr. Cronnemeyer thinks there will be no difficulty at all in securing sufficient workmen to supply the demand. There are already in the United States a large number of experienced workmen, from the Wales tinplate mills, who are at present employed in other lines, and who could be secured at any time, and these could in a very short time instruct others so that there would be plenty of men to supply all of the demands. He has now on his books applications from something like 50 experienced workmen who are ready to go to work whenever the plant shall be ready, and with the number that are now in the country to instruct our own workmen there would be no trouble in the securing all the help needed.

There has been a number of reports current recently in regard to contracts for tinplate mills being let, but when traced to their source those mentioned above are the only reports founded on facts. Hon. F. G. Niedringhaus, accompanied by his brother, visited this place recently and the report was given out that they had made a contract for the erection of an extensivs tinplate mill at St. Louis, but the facts were that they were only investigating the subject; but they did say that as soon as they had given the matter proper investigation they will let the contracts for a large mill. H. A. F.

PITTSBURGH, Dec. 13.

[It may be added, that the Britton Rolling Mill Co., Cleveland, is engaged in the erection of a tinplate mill and expects to turn out a considerable product at an early day.]

In connection with the foregoing we take the following from the *Iron Age*: The first tinplate factory at Chicago starts in operation this week. Norton Brothers, who have a large can factory at Maywood, Ill., and who are among the heaviest consumers of tinplate in the world, are the pioneers in this new field. Their appliances were imported from Wales, so that they might be certain to get the most modern and practical arrangements now in use by the most skillful manufacturers of tinplate. The firm have put in their own special arrangements for handling and cleaning in the tinning house, designed after an exhaustive study of the methods pursued in the Welsh tinplate works. They claim that these appliances are far superior to the system followed in Wales. The force of workmen employed includes expert Welsh tinplate workers whose experience is needed in starting this new industry. The first tinplates turned out will be made from imported black sheets, as the firm are not quite ready to manufacture their own sheets, but will do so in the near future. Meantime they will use imported sheets specially made for tinplates in order to minimize the troubles incident to the starting of a new industry.

The Continental Iron Trade

Latest advices from Europe are to the effect that the tendency in the iron trade is downwards, both as regards demand and prices. The only factor in the maintenance of iron and steel prices at a satisfactory level is the high cost of fuel, and even in this branch a downward movement has now commenced. The Bavarian State Railways have refused to pay the inflated prices for coal and coke demanded by the German Associations, and in Belgium the basis price for coke has declined within the past few weeks.

There is reported a certain resumption of demand in the German iron trade, and as a consequence prices are firmer on the home market. Pig iron is weaker, in face of Luxembourg rivalry. For foreign orders, however, underselling is prevalent, and it is this action on the part of the German ironmasters which is one of the chief disturbing elements at present in the Belgian and French metallurgical industries. The ironmasters are complaining severely of the increased competition of basic steel with their products, and in Germany, as well as in Belgium and France, the output of this class of metal is being largely augmented.

Belgian ironmasters complain that present prices are utterly unremunerative, and in some cases they are refusing to accept orders at the actual selling price for No. 1 bars and joists, f. o. b., Antwerp. Short time is being worked at many of the mills and forges, and employment at the steel works is very slack. The Government has lately given out fair orders for railway rolling stock and material, which will help to relieve the current quietude at the engineering shops and iron foundries.

The French iron trade occupies a steady position.

In Russia the Ural and Nijni-Novgorod Iron Works are extremely busy in the production of railway and building sections for the home market, and German competition seems now to be pretty completely vanquished.

Next to Krupp.

Next to those of the Krupp Co., the mines, forges and steel works of the Dortmund Union are the most extensive in Germany. The total value of the output in the financial year 1889 90 is returned at £2,200,000, against £1,750,000 in 1888-9. In all, 7,815 men are employed by the Union, and the amount of the salaries and wages paid during the year was £425,744. The average of the wages of the workmen was £54, against £49 in 1888 9 and £47 in 1887 8. A dividend at the rate of four per cent. has been declared for 1889-90, against three per cent. for 1888.9

The May-Mazeppa Silver Mine.

The mine is located in Gunnison County, Colorado, and is the property of the May-Mazeppa Mining Co., of which Mr. W. J. Hilands is the Cleveland representative. The present mine represents the consolidation of half a dozen adjacent mines, and is claimed to embrace one of the richest deposits of silver and lead in Colorado.

RECOLLECTIONS OF SIXTY YEARS IN THE IRON BUSINESS.

In 1831 I saw, for the first time, a nail machine in position that had been used some years previous. The head of the nail from this machine was put on with a hand hammer, but the nails were being made in several factories about this time, complete. One of the customs in Chester county (Pa) mills (being all that I knew of at this time) was that during harvest time the works would be closed for a week or two, according to the amount of crops to be cared for, and all hands, young and old, went into the field to do what they could to help get it in. In the Fall they would gather in the corn and husk it, and when all done there was a supper at what was called the "Big House," (house of the proprietor) for all concerned. I remember that the owners of the works at which my father and I were engaged, were Quakers by the name Lukins & Pennock. Mrs. Pennock, being fond of a joke, cooked a guinea fowl that was said to be 30 years old, and placed on the table to be carved first, she posting herself in a convenient position to see the carving done. Suffice it to say, that Spring chicken was never carved, and when the carver gave up the job the old lady joined in the laugh as heartily as the rest. Then the fowls intended for the jubilee were brought on.

Among the workers in this part of the country at this time, there were no furnace builders. The heater built his own furnace, and during this time I took my first lesson in that line. The heater was expected to light his own furnace, which would require from eight to ten hours, and going with my father, I learned to assist him. In short, the work of the heater was laborious, much more so than now. The tonnage produced is now much greater than in the early days, but the heavy, laborious work is now done by the helpers and the worst of it is now done by machinery.

About this time railroads were being introduced near Philadelphia, one of which was between Philadelphia and Norristown, a distance of about 17 miles, the longest, perhaps, known at this time. I took my first ride on a locomotive between Philadelphia and Manayunk, 7 miles, my uncle being, for that trip, the engineer. He made the run in 14 minutes, including two stops. I have always liked the machine since that ride—and I feel so about the rolling mill, when my mind runs back to the small affairs of that day, and I see what they have grown to be. And again, when I think of the work we did in the years of the '30's, '40's and '50's, and how we figured up our wages, what kind of pay we were to get—and often where it was money, the question was, what would it be worth, and what would we do with it? I made up my mind to get it into the bank as soon as possible, or into gold if I feared the bank. The situation during the '30's and '40's may be summed up as bad and worse; during the '50's times were somewhat easier; perhaps it was because we had learned to adapt ourselves to the changed conditions until 1857, when the cyclone came and made up for lost time. Failures and wrecks were the rule, and it was not until the war of 1861 came that we knew who was solid; but from that time on, a new order of things was brought about.

In regard to puddling, there has been a complete change. Previous to 1840, about all the puddling done in this, or I suppose, any other country, was done by what was known as the drying process, which was as follows: Pig iron was charged into the refinery fire. This was a box nearly square, say four feet long, three feet wide the top of which was level with the floor, with hollow water-boxes around the sides and ends, and with fire brick bottom. In one side were two and sometimes three tuyere-hollows, the same as now used in blast furnaces, in which water was used to keep them cool. The depth of the box was 12 to 15 inches, according to the wishes of the refiner. Into this box a bed of coke was placed, filling the box. Then a charge of pig iron, say 2,000 to 3,000 pounds, according to the size of the fire box, was put in. Rising upon the side and directly above the tuyeres was a back-wall built with fire brick about four feet high, and mounted upon this wall and properly supported, was a chimney for carrying off the flame, heat and gas produced, and to protect the workmen. When the iron was charged and a bed of coke piled on top of the pig iron, the blast was turned in, similarly to turning the blast into our blast furnaces now. The manager of the works would instruct the refiner as to the character of the iron he desired, whether highly blown or otherwise; then it was left to him to do the rest. When the pig iron was all melted and blown sufficiently, it was tapped out at the bottom of the box and only at one end, similar to tapping the blast furnace, the metal running into a cast iron mould eight feet long by two feet wide and six deep, the sides flaring so as to be easily taken out when cold. When the melted iron was all received into this mould it was allowed to remain therein until it was no longer in a fluid state, then a large volume of water was thrown on to it and kept running until all was cold. Then it was called plate metal, the plate being about three inches thick. This was broken up into pieces of convenient size for handling, and about 420 pounds of this metal made a charge for a puddling furnace and six charges a day a turn's work.

The puddler's work was to melt this and work it at a reduced heat, adding a proper amount of cinder taken from previous heats, that had been hammered and rolled to bring the charge in the furnace into a light ferment, which was done by the use of the tools used for puddling by the puddler and his helper. When the charge had fermented sufficiently, the heat was still reduced by the damper and the use of some water and constant working, until the whole charge appeared like so much sand and gravel, and could be piled up in the furnace as could that much sand. At this point the charge of iron was styled dry. From this on, the heat in the furnace was increased by raising the damper and firing, and as the heat increased the particles would adhere until the whole mass was in one lump. The puddler at this point would part it into four or five balls, as might be required, take it to the hammer, placing it properly under the hammer, which was going at the rate of from 80 to 90 blows a minute; and many of the old-time puddlers went to their long home minus an eye or finger, while some of the fingers were in bad shape, if not lost through getting the balls under the hammer.

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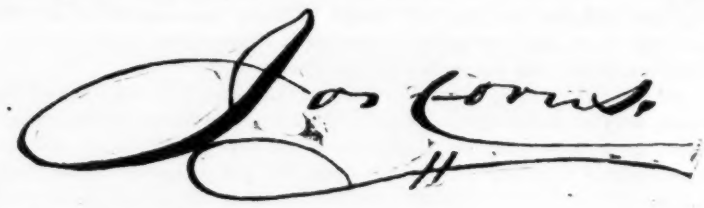
The use of the blast for heating and puddling is a great improvement in the hands of skilled workmen in respect to quantity, but with the careless and unskillful it is a great damage as to the waste and *quality* of the iron. The general management was then more careful of the quality than the quantity. Now all you can hear is, how much a certain mill produced in so many hours.

The modern wire mill was no more thought of than the telegraph, telephone, or any of the other uses to which electricity is now applied; and the same may be said to almost the same extent in regard to steel making in this country. If the number of rails now made from steel were required to be made from iron, and that iron to be puddled as before the war, puddlers would be as scarce as sewing women would have been during our late war, had it not been for for the sewing machine.

The results of the changes that have taken place in the 60 years of my experience in the iron business are, that in all of them the owners have been careful to husband their income in such a way that they have been growing in wealth from one decade to another; but I am sorry to say that the same can not be said of the army of iron workers as a class, notwithstanding their greatly increased incomes during the late war. It is greatly to the credit of many of them that they did make hay while the sun shone, and are still doing it; but the same was true of a portion of them during all these years, and I believe that portion was as large then as now, if not larger. It would doubtless be vastly better for them and their families, and certainly for the country, if they as a class were to commence to build up their fortunes as did the persons who now hold them. There is but one royal road to that goal for them, namely, untiring industry and very rigid economy.



MASSILLON, O., December, 1890.

The Valley Freight Rates.

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The furnacemen asked: 1. A reduction of 20 cents per ton on the present freight rate from the Connellsville region to the Mahoning and Shenango valleys, to go into effect at the earliest date possible.

2. A reduction of 15 cents per ton on pig iron, from the Mahoning and Shenango valleys to Pittsburgh.

3. A general rate of 25 cents per ton on limestone, from all limestone quarries to the Mahoning and Shenango valleys.

These requests were followed up by strong arguments from the pig iron men.

A PATENT on a process of making planished sheet steel has been granted to George Atkins, Cleveland, The process is for making soft steel sheets with a glazed or planished surface. This is done by rolling the sheets from bars heated in furnace with a charcoal bottom and wood fire. Next the sheets are reheated in packs by the same means and rerolled, the process of reheating and rerolling being continued until the sheets are of the required dimensions. Finally, the sheets are put in an air-tight box and annealed in a furnace of the kind described, having a charcoal bottom and a wood fire.

IRON INTERESTS AND OUR SLAVONIC POPULATION.

Every one interested in the iron industries of this country ought to take a deep and practical interest in the evangelization of the Slavonic population, which helps to develop those industries. Were it not for the large number of laborers of foreign birth and parentage in this country, it would be impossible to carry on the great industries so essential to the wealth and prosperity of the United States. These industries of our country need these laborers; they need these industries. But it makes a vast difference in the success of any enterprise that employs labor, whether the laborer is contented, intelligent and conscientious, or discontented, stupid and conscienceless in his work. The superior education and intelligence of the German soldier was one of the chief reasons for the great victories of 1866 and 1870 over the renowned Austrian and French armies. Intelligence, conscience and good will play a most important part in the industrial world. It is not only the bounden duty, but the truest interest of every manufacturer, to cultivate these qualities in those whom he employs. The Golden Rule, lived up to by employer and employed, would produce a golden harvest, both moral and financial. But employers, and such as truly seek the welfare of their workers, are apt to complain, as one largely interested in iron mining did to me not long since, that there is no use in trying to apply the Golden Rule, since selfish employes defeat well-meant efforts for their good. The obvious answer is that, while it is certainly discouraging that kindness should be met by cold selfishness, such experience only proves the more clearly the need of improving the moral conl dition of such laborers, both for their own sake and that of the industria-interests with which they are connected. It is only by cultivating the higher part of man's nature that he can be made intelligent and conscientious enough to see that both interest and duty demand faithfulness to the employer's interests. All history and experience since the Christian era commenced, go to prove, beyond a question, that the only influence able to accomplish this is the Christian religion. Who doubts that if the spirit and principles of Christ's Sermon on the Mount were universally accepted and lived up to by employer and employed, a vast change for the better would come over the industrial world, one of whose crying needs is, conscience wrought into every fabric.

The iron manufacturers of the United States employ a large number of Slavonic laborers—Bohemians, Poles and Hungarians, or Slovaks, as they call themselves. As near as can be estimated, there are in this country about one-third of a million Bohemians, one to one and a half million Poles (of whom there are 100,000 in Chicago alone), and 100,000 Slovaks. These come chiefly from the poorer and more ignorant classes in the old country. They come to us from under the galling yoke of ecclesiastical and political despotism; here they are either under the repressive power of Rome, which does all in its power to prevent their enjoying the privileges of our free common school system and becoming intelligent American citizens, or else they come under the power of a reaction which carries them into the ranks of unbelievers and makes them more or less, enemies of Christianity; from these latter are recruited the ranks of Socialists and Anarchists, though it is only fair to say that this is not nearly so much the case among the Slavic as among the German population. Unless reached with the uplifting influences of the gospel, large numbers of them are worse off in this country than in the old. A Bohemian once said to me: "Sir, it is bad in this country; in the the old country, every man pays for his own drink; here, he must stand treat all around." Drunkenness works terrible mischief among this population, as every manufacturer, certainly every foreman under whom they work, knows but too well. For the most part, they have no connection whatever with the best portion of our English, speaking population, and it is a simple fact that the first English many of them learn is that used in profane swearing. Many of them think that American liberty means license. If these people are to be made intelligent American citizens, if they are to use freedom in the right way, if they are to be faithful workmen, to build up real homes, nurseries of virtue, they must be reached with the refining and elevating influence of a pure Christianity. That this can be succesfully done has been proved beyond a doubt. Within a few years, four different Protestant denominations have taken hold in earnest of Christian work for Slavic population. As a sample of what may be accomplished, I will only refer to the work started in Cleveland, in 1883, by the earnest efforts of the lamented Rev. Charles Terry Collins, who secured the co-operation of a number of Cleveland's foremost citizens, and called me, who had been a missionary in Bohemia for a number of years, to undertake the work. Absolutely nothing had been done with a view of reaching the 25,000 Bohemians of this city. Now the Congregationalists have three Bohemian mission stations in the city; the Methodists, one. The work commenced in 1883 has spread, under the direction of the American Home Missionary Society, to 18 stations in nine different States, reaching from Pennsy'-vania and Ohio to Minnesota and Nebraska. The great difficulty at the start was the lack of missionaries acquainted with the Slavic languages. This led to the starting, in 1885, of a Slavic missionary training department in Oberlin, where young Bohemians and Poles, taken at first from the work-shop and the factory, were trained to become missionaries to their own people; and the next year a Bible readers' school was started in Cleveland, where young women of these nationalities are trained as female missionaries to their own people Both these schools have met with success beyond our expectations, and have most happily solved the difficult problem of how to reach the great Slavic population of our land, scattered far and wide. These missionaries have proved themselves capable, faithful and successful, and those kind friends of the Slavic population of our land, who have contributed toward their training, have the eminent satisfaction of knowing that they have helped to do a work which but a few year ago seemed well nigh hopeless. Abundant illustrations could be given of the fact that those classes of our immigrant population most difficult for our American Christian civilization to assimilate, can be reached and won as fellow-helpers in the great work of building up this country on the true foundation of virtue, sobriety, industry and love to God and man.

CLEVELAND, December, 1890. H. A. SCHAUFFLER.

UTILIZATION OF WASTE HEATS FOR GENERATING STEAM IN IRON AND ROLLING MILLS.

The advantage of mills situated in Pittsburgh and other gas territory, over those where coal has to be used for heating and steam purposes, has been in a measure overcome by utilizing the heat from puddling and heating furnaces by the use of Hazelton tripod boilers, of Chicago. Captain Charles Hallett, of the above company, now located at the Hollenden Hotel, Cleveland, has made this a study for several years. The trouble hitherto in utilizing the waste heats with the tubular or flue boilers has been owing to the injury done the draft of the furnaces, as only a small proportion of the heat was utilized by these boilers. The construction of the Hazelton tripod boiler is such that it obviates this trouble, and the draft is rather stronger than in in the ordinary stack direct.

The first boiler that he erected for this purpose was a '400 horse-power for utilizing the waste heats from a Blume furnace for the Chicago Spring & Tire Co., of Chicago. This boiler developed over 600 horse-power by the waste heat from the Blume furnace. It has now been running four years. Below is given a copy of a test made on a 125 horse-power Hazelton tripod boiler, using the waste heats from two puddling furnaces made at the Cherry Valley Iron Co.'s works, Leetonia, O.:

Duration of test	4 hours.
Water evaporated	15,321 lbs.
Coal consumed—Washingtonville	2,000 lbs.
Temperature of feed water	170 degrees "F."
Pressure of steam	80 lbs.
Horse power developed	128 lbs.
Pounds of water evaporated per pound of coal used in the puddling furnaces	7 60-100.

A water damper was used in the neck of each puddling furnace, so that each furnace could be regulated without interfering with the other. This shows a better evaporation than where coal is fired direct under a tubular boil-for steam purposes, and shows the immense gain in utilizing the waste heats from furnaces, either puddling or heating. He also erected a 125 horse power boiler at the Wellsville Sheet Iron & Plate Co., at Wellsville, O. This boiler was tested recently, after being in use six months on a heating furnace, in a six-hour run and the furnace only being fired up the night, before averaged 125 horse hower. These results demonstrate that there is waste heat from puddling and heating furnaces more than sufficient to evaporate steam for the power used in the mill. This being the fact, mills whose outlay for steam purposes are from $40 to $75 a day can save by utilizing the waste heats, and with a close margin it means the profit or loss of the business.

The Future of the Steel Rail Trade of America.

In a well considered article on the present condition of the steel rail industry of the United States, a correspondent signing himself "Ironmaster,' thus ventures to predict in the Philadelphia *Manufacturer*:

The rail trade of this country has reached a point where future competition must naturally rest between a few large and well-managed concerns, operating works of large capacity under the most economical methods, and with machinery capable of turning out great quantities of rails with the least possible expense for labor. It is only by a comparison of the machinery of the various rail mills that a correct conception may be had of the enormous amount of capital that has been wiped out during recent years by the active competitiou that has prevailed, and it is those works which have introduced the most effective machinery, or have enjoyed other special advantages ensuring low cost of production, that are manufacturing rails to-day. The Illinois Co.'s works, and the two plants of the Carnegie firm enjoy special advantages of location for low cost of materials and distribution of product. The latter firm, although paying as high rates of wages as prevail in any other similar works in the country—if, indeed, not higher—are able to obtain raw materials at an exceptionally low price, owing to the large quantities consumed, and also to the company's business methods and associations. These two companies practically control the larger part of the Western trade.

The Cambria Co., in addition to low cost of materials, are favorably located for the supply of cheap labor, although their machinery is probably not so economically arranged as in a few other mills, and it does not appear that this company are making any active preparations to take a prominent part in competing for the steel rail trade of the future. What effect the enlargement of the business of the Bethlehem Iron Co. in other directions may have upon their future position in the rail trade cannot be determined. The growth of the demand for war material may ultimately result in the company devoting their main attention to this important branch of their business in which competition is not so close as the manufacture of rails.

That the Pennsylvania Steel Co. will continue as a leading producer of rails is seen by their removal to a more favorable location, where their plant will be of the most approved design and construction, although not exclusively devoted to the manufacture of rails.

The two Scranton companies, for reasons given, will continue as large producers of steel rails, and if the consolidation of the two plants take place, negotiations for which have recently been made, the new company would be further strengthened in the fight for a share of the rail business, especially in the East.

Acknowledgments.

To the courtesy of *Seaboard*, New York, we are indebted for several cuts used in this issue.

NICKEL PLATE to Washington, D. C., and return, via Buffalo, $15. Tickets good eleven days; $3 extra to return via New York City.

RECOLLECTIONS OF SIXTY YEARS IN THE IRON BUSINESS.

In 1831 I saw, for the first time, a nail machine in position that had been used some years previous. The head of the nail from this machine was put on with a hand hammer, but the nails were being made in several factories about this time, complete. One of the customs in Chester county (Pa) mills (being all that I knew of at this time) was that during harvest time the works would be closed for a week or two, according to the amount of crops to be cared for, and all hands, young and old, went into the field to do what they could to help get it in. In the Fall they would gather in the corn and husk it, and when all done there was a supper at what was called the "Big House," (house of the proprietor) for all concerned. I remember that the owners of the works at which my father and I were engaged, were Quakers by the name Lukins & Pennock. Mrs. Pennock, being fond of a joke, cooked a guinea fowl that was said to be 30 years old, and placed on the table to be carved first, she posting herself in a convenient position to see the carving done. Suffice it to say, that Spring chicken was never carved, and when the carver gave up the job the old lady joined in the laugh as heartily as the rest. Then the fowls intended for the jubilee were brought on.

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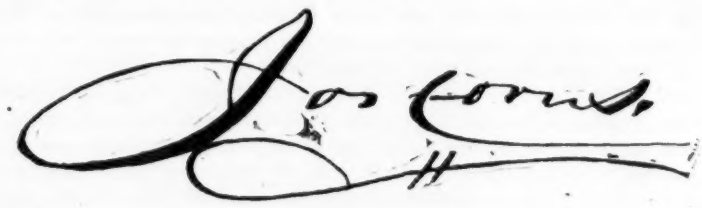

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The furnacemen asked: 1. A reduction of 20 cents per ton on the present freight rate from the Connellsville region to the Mahoning and Shenango valleys, to go into effect at the earliest date possible.

2. A reduction of 15 cents per ton on pig iron, from the Mahoning and Shenango valleys to Pittsburgh.

3. A general rate of 25 cents per ton on limestone, from all limestone quarries to the Mahoning and Shenango valleys.

These requests were followed up by strong arguments from the pig iron men.

A PATENT on a process of making planished sheet steel has been granted to George Atkins, Cleveland, The process is for making soft steel sheets with a glazed or planished surface. This is done by rolling the sheets from bars heated in furnace with a charcoal bottom and wood fire. Next the sheets are reheated in packs by the same means and rerolled, the process of reheating and rerolling being continued until the sheets are of the required dimensions. Finally, the sheets are put in an air-tight box and annealed in a furnace of the kind described, having a charcoal bottom and a wood fire.

IRON INTERESTS AND OUR SLAVONIC POPULATION.

Every one interested in the iron industries of this country ought to take a deep and practical interest in the evangelization of the Slavonic population, which helps to develop those industries. Were it not for the large number of laborers of foreign birth and parentage in this country, it would be impossible to carry on the great industries so essential to the wealth and prosperity of the United States. These industries of our country need these laborers; they need these industries. But it makes a vast difference in the success of any enterprise that employs labor, whether the laborer is contented, intelligent and conscientious, or discontented, stupid and conscienceless in his work. The superior education and intelligence of the German soldier was one of the chief reasons for the great victories of 1866 and 1870 over the renowned Austrian and French armies. Intelligence, conscience and good will play a most important part in the industrial world. It is not only the bounden duty, but the truest interest of every manufacturer, to cultivate these qualities in those whom he employs. The Golden Rule, lived up to by employer and employed, would produce a golden harvest, both moral and financial. But employers, and such as truly seek the welfare of their workers, are apt to complain, as one largely interested in iron mining did to me not long since, that there is no use in trying to apply the Golden Rule, since selfish employes defeat well-meant efforts for their good. The obvious answer is that, while it is certainly discouraging that kindness should be met by cold selfishness, such experience only proves the more clearly the need of improving the moral conl dition of such laborers, both for their own sake and that of the industria-interests with which they are connected. It is only by cultivating the higher part of man's nature that he can be made intelligent and conscientious enough to see that both interest and duty demand faithfulness to the employer's interests. All history and experience since the Christian era commenced, go to prove, beyond a question, that the only influence able to accomplish this is the Christian religion. Who doubts that if the spirit and principles of Christ's Sermon on the Mount were universally accepted and lived up to by employer and employed, a vast change for the better would come over the industrial world, one of whose crying needs is, conscience wrought into every fabric.

The iron manufacturers of the United States employ a large number of Slavonic laborers—Bohemians, Poles and Hungarians, or Slovaks, as they call themselves. As near as can be estimated, there are in this country about one-third of a million Bohemians, one to one and a half million Poles (of whom there are 100,000 in Chicago alone), and 100,000 Slovaks. These come chiefly from the poorer and more ignorant classes in the old country. They come to us from under the galling yoke of ecclesiastical and political despotism; here they are either under the repressive power of Rome, which does all in its power to prevent their enjoying the privileges of our free common school system and becoming intelligent American citizens, or else they come under the power of a reaction which carries them into the ranks of unbelievers and makes them more or less, enemies of Christianity; from these latter are recruited the ranks of Socialists and Anarchists, though it is only fair to say that this is not nearly so much the case among the Slavic as among the German population. Unless reached with the uplifting influences of the gospel, large numbers of them are worse off in this country than in the old. A Bohemian once said to me: "Sir, it is bad in this country; in the the old country, every man pays for his own drink; here, he must stand treat all around." Drunkenness works terrible mischief among this population, as every manufacturer, certainly every foreman under whom they work, knows but too well. For the most part, they have no connection whatever with the best portion of our English, speaking population, and it is a simple fact that the first English many of them learn is that used in profane swearing. Many of them think that American liberty means license. If these people are to be made intelligent American citizens, if they are to use freedom in the right way, if they are to be faithful workmen, to build up real homes, nurseries of virtue, they must be reached with the refining and elevating influence of a pure Christianity. That this can be succesfully done has been proved beyond a doubt. Within a few years, four different Protestant denominations have taken hold in earnest of Christian work for Slavic population. As a sample of what may be accomplished, I will only refer to the work started in Cleveland, in 1883, by the earnest efforts of the lamented Rev. Charles Terry Collins, who secured the co-operation of a number of Cleveland's foremost citizens, and called me, who had been a missionary in Bohemia for a number of years, to undertake the work. Absolutely nothing had been done with a view of reaching the 25,000 Bohemians of this city. Now the Congregationalists have three Bohemian mission stations in the city; the Methodists, one. The work commenced in 1883 has spread, under the direction of the American Home Missionary Society, to 18 stations in nine different States, reaching from Pennsylvania and Ohio to Minnesota and Nebraska. The great difficulty at the start was the lack of missionaries acquainted with the Slavic languages. This led to the starting, in 1885, of a Slavic missionary training department in Oberlin, where young Bohemians and Poles, taken at first from the work-shop and the factory, were trained to become missionaries to their own people; and the next year a Bible readers' school was started in Cleveland, where young women of these nationalities are trained as female missionaries to their own people Both these schools have met with success beyond our expectations, and have most happily solved the difficult problem of how to reach the great Slavic population of our land, scattered far and wide. These missionaries have proved themselves capable, faithful and successful, and those kind friends of the Slavic population of our land, who have contributed toward their training, have the eminent satisfaction of knowing that they have helped to do a work which but a few year ago seemed well nigh hopeless. Abundant illustrations could be given of the fact that those classes of our immigrant population most difficult for our American Christian civilization to assimilate, can be reached and won as fellow-helpers in the great work of building up this country on the true foundation of virtue, sobriety, industry and love to God and man.

CLEVELAND, December, 1890. H. A. SCHAUFFLER.

UTILIZATION OF WASTE HEATS FOR GENERATING STEAM IN IRON AND ROLLING MILLS.

The advantage of mills situated in Pittsburgh and other gas territory, over those where coal has to be used for heating and steam purposes, has been in a measure overcome by utilizing the heat from puddling and heating furnaces by the use of Hazelton tripod boilers, of Chicago. Captain Charles Hallett, of the above company, now located at the Hollenden Hotel, Cleveland, has made this a study for several years. The trouble hitherto in utilizing the waste heats with the tubular or flue boilers has been owing to the injury done the draft of the furnaces, as only a small proportion of the heat was utilized by these boilers. The construction of the Hazelton tripod boiler is such that it obviates this trouble, and the draft is rather stronger than in in the ordinary stack direct.

The first boiler that he erected for this purpose was a 400 horse-power for utilizing the waste heats from a Blume furnace for the Chicago Spring & Tire Co, of Chicago. This boiler developed over 600 horse-power by the waste heat from the Blume furnace. It has now been running four years. Below is given a copy of a test made on a 125 horse-power Hazelton tripod boiler, using the waste heats from two puddling furnaces made at the Cherry Valley Iron Co.'s works, Leetonia, O.:

Duration of test	4 hours.
Water evaporated	15,321 lbs.
Coal consumed—Washingtonville	2,000 lbs.
Temperature of feed water	170 degrees "F."
Pressure of steam	80 lbs.
Horse power developed	128 lbs.
Pounds of water evaporated per pound of coal used in the puddling furnaces	7 60-100.

A water damper was used in the neck of each puddling furnace, so that each furnace could be regulated without interfering with the other. This shows a better evaporation than where coal is fired direct under a tubular boil-for steam purposes, and shows the immense gain in utilizing the waste heats from furnaces, either puddling or heating. He also erected a 125 horse power boiler at the Wellsville Sheet Iron & Plate Co., at Wellsville, O. This boiler was tested recently, after being in use six months on a heating furnace, in a six-hour run and the furnace only being fired up the night, before averaged 125 horse hower. These results demonstrate that there is waste heat from puddling and heating furnaces more than sufficient to evaporate steam for the power used in the mill. This being the fact, mills whose outlay for steam purposes are from $40 to $75 a day can save by utilizing the waste heats, and with a close margin it means the profit or loss of the business.

The Future of the Steel Rail Trade of America.

In a well considered article on the present condition of the steel rail industry of the United States, a correspondent signing himself "Ironmaster,' thus ventures to predict in the Philadelphia *Manufacturer*:

The rail trade of this country has reached a point where future competition must naturally rest between a few large and well-managed concerns, operating works of large capacity under the most economical methods, and with machinery capable of turning out great quantities of rails with the least possible expense for labor. It is only by a comparison of the machinery of the various rail mills that a correct conception may be had of the enormous amount of capital that has been wiped out during recent years by the active competition that has prevailed, and it is those works which have introduced the most effective machinery, or have enjoyed other special advantages ensuring low cost of production, that are manufacturing rails to-day. The Illinois Co.'s works, and the two plants of the Carnegie firm enjoy special advantages of location for low cost of materials and distribution of product. The latter firm, although paying as high rates of wages as prevail in any other similar works in the country—if, indeed, not higher—are able to obtain raw materials at an exceptionally low price, owing to the large quantities consumed, and also to the company's business methods and associations. These two companies practically control the larger part of the Western trade.

The Cambria Co., in addition to low cost of materials, are favorably located for the supply of cheap labor, although their machinery is probably not so economically arranged as in a few other mills, and it does not appear that this company are making any active preparations to take a prominent part in competing for the steel rail trade of the future. What effect the enlargement of the business of the Bethlehem Iron Co. in other directions may have upon their future position in the rail trade cannot be determined. The growth of the demand for war material may ultimately result in the company devoting their main attention to this important branch of their business in which competition is not so close as the manufacture of rails.

That the Pennsylvania Steel Co. will continue as a leading producer of rails is seen by their removal to a more favorable location, where their plant will be of the most approved design and construction, although not exclusively devoted to the manufacture of rails.

The two Scranton companies, for reasons given, will continue as large producers of steel rails, and if the consolidation of the two plants take place, negotiations for which have recently been made, the new company would be further strengthened in the fight for a share of the rail business, especially in the East.

Acknowledgments.

To the courtesy of *Seaboard*, New York, we are indebted for several cuts used in this issue.

NICKEL PLATE to Washington, D. C., and return, via Buffalo, $15. Tickets good eleven days; $3 extra to return via New York City.

FUTURE DEVELOPMENT OF THE BASIC PROCESS IN THE UNITED STATES.

In the month of March, 1865, by invitation of the late A. G. Holley, I witnessed the first public blow of Bessemer steel at the works of Winslow, Griswold & Holley, at Troy, N. Y. During the day Mr. Holley informed me that "dephosphorization could not take place in the Bessemer process." I immediately opened my mouth to tell him why, for the thought instantly occurred to me that Bessemer could not dephosphorize for the same reason that Cort could not dephosphorize, *i. e.*, because both practiced the acid process, both had an acid lining, and an acid slag; and as Samuel Rogers had taken Cort's acid lining out of the puddling furnace and put in a basic lining and thus given us the present dephosphorizing puddling furnace, I would take Bessemer's acid lining out of his converter and would put a basic lining and a basic bath in it and thus make the Bessemer a dephosphorizing process. All this ran through my mind while Mr. Holley was telling me the story of Bessemer's trouble, and while I was opening my mouth to tell him how to dephosphorize, a still, small voice said, "Don't! You should patent it," and my mouth closed like a clam. I went home and built an experimental basic plant, and there fully developed the basic process, as may be found in detail in the records of the United States Patent Office, the decisions of which have adjudged me to be the prior inventor. Although the inspiration of the basic process came to me unsought, like a flash of lightning, its development, and subsequent defence in the Courts, cost me many years' hard mental and physical toil and an expenditure of more than a hundred thousand dollars of money.

Owing to the litigation in this country, the basic process has been most largely developed in a commercial sense, in Europe, and has increased from year to year in a wonderful manner. The output was 1,704,481 tons in 1887; 1,953,234 tons in 1888; 2,274,555 tons in 1889.

Basic steel is now being rolled into all forms, but is most desired for wire rods, drop forgings, plates, sheets and bars for smith's work, for beams, angles, tees, girders and all structural forms, as it is free from impurities and more ductile than other steel or iron. It is especially adapted for making tin-plate and pressed metal ware.

The basic process could be practiced to advantage at many points in the North and West, but its greatest development in the world will be in the Southern States, for there the coal, iron and limestone are in such abundance, and in such close proximity to each other, and so well adapted to the basic process, as to give them economic advantages which are probably not equaled by any other locality in the world.

Two objections have been made against the basic Bessemer process, *i. e.*: First, "The comparative small output"; second, "The extra cost of basic lining and basic additions." The first objection is removed by making the vessels larger. The second objection is eliminated by the fact that I am ready to furnish all the basic lining and basic additions required and take the resulting slag as my pay.

The actual cost of making basic steel will depend on the location and the surroundings, and is not a proper matter for newspaper columns. But to any parties who are interested to know the cost in detail, I will always be ready to answer. We are now just on the tide of a wonderful development of iron and steel for structural purposes, and for the manufacture of tin plate, and the opportunity of the South lies in the development of the basic Bessemer and the basic open-hearth processes.

Sidney Reese

400 CHESTNUT ST., PHILADELPHIA.

Christmas and New Year's Excursions via Valley Railway.

On December 24, 25 and 31, 1890, and January 1, 1891, the Valley Railway will sell excursion tickets from all stations on their line, at one and one-third fare for the round trip. Tickets good going on the day of sale, and good returning up to and including January 5, 1891. For further information apply to agents, or J. B. Caven, Gen. Pass. Agent, Cleveland, O.

Holiday Excursions via the Pennsylvania Lines.

Excursion tickets will be sold at reduced rates at all ticket stations of the Pennsylvania lines west of Pittsburgh on December 24th, 25th and 31st, 1890, and January 1st, 1891. Tickets will be good returning until January 5th, inclusive.

FIFTEEN dollars to Washington, D., C., and return, $3 extra to return via New York City. The Nickel Plate will sell excursion tickets to Washington, D. C., and return, via Buffalo, on Monday, December 22d, at rate of $15 from Cleveland. Passengers may return via New York City by paying $3 extra. Tickets good returning until December 31st, 1890.

WASHINGTON, D. C., and return direct, $15; to return via New York City $18 00. Tickets on sale by Nickel Plate agents December 22d, good to return to Buffalo until December 31st, inclusive; good returning from Buffalo until January 3d, 1891.

J. H. Day & Co., of Cincinnati, furnished the complete outfft of bakers' machinery for R. B. Ward & Co.'s new bakery, in Pittsburgh, Pa. This bakery will be one of the most convenient in the United States.

JOSEPH R. OLDHAM, naval architect, will henceforth represent the American Shipmasters' Association, or record of American and foreign shipping, at his office in Cleveland, O.

INDUSTRIAL SUMMARY.

Machine shops are to be erected at Knoxville, Tenn, by the Knoxville Southern Railroad Co.

The Texas Rolling Mill Co., recently incorporated at Fort Worth, Tex, have a capital stock of $50,000.

The Adams Saw Mill Works, of Chattanooga, Tenn, are adding an iron foundry, machine and boiler shops.

The Harriman Furnace Co. have been incorporated at Harriman, Tenn., to erect and operate an iron furnace.

The machine shops of the Missouri, Kansas & Texas Railway Co., located at Greenville, Tex., are to be enlarged.

At Harriman, Tenn., the Harriman Tack Co. have been incorporated to purchase and operate the tack factory of Fosgate & Lane.

A new machine shop, 50x100 feet in dimensions, is being erected at Clarendon, Tex., by the Fort Worth & Denver City Railroad Co.

The Columbus Iron Works Co., of Columbus, Ga., are preparing to place in position in their foundry an electric welding equipment.

The Salem Iron Works, with a maximum capital stock of $300,000, have been organized at Salem, Ga., to establish a wire nail factory.

The machine and blacksmith shop of the Carlisle (Pa.) Car Manufacturing Co. were recently destroyed by fire. The loss is about $10,000, covered by insurance.

The Totten & Hogg Iron & Steel Foundry Co. are making a number of important additions to their works, corner Twenty-fourth and Railroad streets, Pittsburgh, Pa.

Any one wanting a 4 horse-power "Otto" gas engine, in good order can address Geo. C. James & Co., Cincinnati, O. Otto gas engines are scarce, and we thought this might be of interest to our readers.

The Crane Co., of Chicago, are making arrangements to rebuild the pipe mill recently burned. It will be located on the old site on the corner of Fulton and Desplaines streets. Three buildings will be erected.

The Hattiesburg Machinery & Car Manufacturing Co. have been incorporated at Hattiesburg, Miss., by F. E. Colborth, G. E. Kemper, T. J. George and others. A site has been secured, and the erection of the company's plant will be begun at once.

The foundations of the Crane Iron Co.'s Works, Radford, Va, have been completed, and the ironwork on stoves is being placed in position. Thomas H. Walker & Co., the contractors for this plant, have also the contract for the construction of the Iron Pipe Works, at that place.

The Columbus Stove & Fuel Co., Chicago, Ill., have been incorporated, with a capital stock of $300,000. The incorporators are Newton F. Gordon, J. D. Miller and W. B. Jarvis. The company will manufacture stoves, hardware and other specialties and fuel.

J. H. Day & Co., Cincinnati, O., manufacturers of the Hunter's sifters and mixers, received an order last week from a leading firm in London for one of their large size mixers. They now have quite a number of their machines in England, and the demand for them there is constantly increasing.

On the 10th inst, a charter was granted to the Pennsylvania Foundry & Machine Co., of Pittsburgh, with a capital stock of $30,000. The following are the directors of the new company: Theodore Doerflinger, George P. Letche, Wm. J. Woods, Morton Hunter and John M. Griffin, of Pittsburgh.

Shortly after the first of the year the Armington & Sims Engine Co, of Providence, R. I., will begin the erection of an engine building plant in St. Louis, which will cost in the neighborhood of $5,000,000. It is expected that this establishment will give employment to between 400 and 500 hands.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 7th day of January, 1891, for the iron beams, etc., for first floor, basement columns, &c., for the United States Post Office, &c., building, at Scranton, Pa.

Prominent capitalists of Milwaukee and the East are reported to have purchased a large tract of land near Milwaukee, Wis., upon which it is proposed to erect large car works to give employment to 1,000 men. The proprietors of the Milwaukee Car Wheel Works are said to be interested. Work on the buildings is to begin soon.

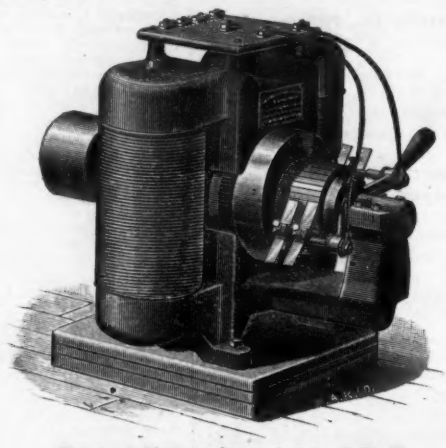
The Bellaire Stamping Co., of Bellaire, O., have commenced the erection of a three story iron building to take the place of the wooden building destroyed by fire some weeks ago. The firm have now a force of machinists at work preparing dies to be used in the new plant, and they expect to resume business again about January 15 next.

It is reported at Glasgow, Va., that the Superior Mfg Co., of Springfield, O., and the firm of Chamberlain & Ryders, of Hudson, Mich., contemplate the location in Glasgow of the respective agricultural implement works. In the event of the transfer being made these two concerns will organize as one company, consolidate the two plants and operate under one manager.

Charles Kennedy, superintendent of the plant of the Union Rolling Mill Co., of Cleveland, has recently designed a puddling furnace for use with fuel gas, and it has been given a trial at the above works, under the superintendence of the inventor. The tests made are said to have shown favorable results. It is claimed to be simpler and more economical in construction than those heretofore built, and it is also easily operated.

The Stiles & Parker Press Co., of Middletown, Conn, has been consolidated with the E. W. Bliss Co., Limited, of Brooklyn, N. Y. The two firms are among the leading manufacturers of presses and dies in this country. By the terms of the new arrangement, the business at Middletown will be conducted for the present under the old name, though the principal office will be at No. 17 Adams street, Brooklyn. It is understood that the manufacture of large toggle-drawing presses will be concentrated at the Brooklyn plant, which will be shortly enlarged by the addition of a building 60x100 feet.

The Cordesman Machine Co., of Cincinnati, O., are more than pleased with this year's business, being the largest ever done. They have been run-



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Write for descriptive catalogue and general information.

THE CARD ELECTRIC MOTOR & DYNAMO CO., Cincinnati, O.

ning their extensive shops until eight o'clock for moths past, and they have increased their facilities by adding three new lathes, one new planer, and one universal radial drill. With these additions, they will be able to handle their constantly increasing trade to the entire satisfaction of their customers. They are pushers and intend to keep abreast of the times. They have just received an order for a complete outfit of wood working machinery for Havana, Cuba, including their celebrated band, scroll and resaw.

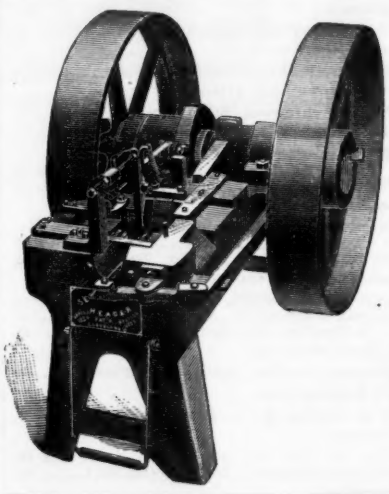
It is not so well known as it might be that Cincinnati, O., has an industry which is now the largest of its kind in the world, viz.: that of building woodworking machinery. The products of the various firms engaged in it are shipped to every clime and nation. The largest concerns are the Egan Co. and J. A. Fay & Co. Both of these establishment occupy extensive buildings, filled with modern machinery, and employ nearly 1,000 workmen. Their output runs into the millions. The guiding spirits and managers are, respectively, Thomas P. Egan, President of the Egan Co., and W. H. Doane, President of J. A. Fay & Co., and both are millionaires. Mr. Egan is now the youngest millionaire in Cincinnati, being but 43 years of age, having fought his way up from an apprentice without a dollar, step by step, until he arrived at a position "at the top." W. H. Doane is known to the army of Sunday-school scholars of the country as the composer of many of the sweet songs sung by them.

It can hardly be realized that an injector that has only been on the market a period of four years, should at the present time be used in greater quantities, than injectors that have been from eight to 10 years before the public. Figures, however, speak for this, and the manufacturers of this popular boiler feeder report to us that the sales have now reached over 39,000. When it is taken into consideration, that the old style injectors have from three to five valves and handles to manipulate, while the Penberthy has but two, it is no wonder that on this account alone, and its simplicity, it should take precedence over all others. The other leading features that have recommended it to the steam-using public, are its automatic qualities and reliability. After the steam has reached, as we understand it, a pressure of about 50 lbs., it is only necessary to open and close the steam throttle to start and stop the feed to the boiler. The automatic qualities consist of its restarting without the adjustment of any of the valves, if from any cause the feed to the boiler should be temporarily broken, from a sudden jar or air getting into the suction pipe; this in itself cannot be too highly appreciated, as they require less attention and watching on this account. The manufacturers of this injector, The Penberthy Injector Co., of Detroit, Mich., expect to turn out 15,000 injectors during 1891; they have made all preparations for doing so, having enlarged their factory to three stories, covering a lot 54x78, and also added over $6,000 worth of machinery during the past six months.

Heavy Hardware Jobbers' National Union.

An interesting and important meeting of this body was held in Chicago, on the 12th and 13th inst. Members were in attendance from Chicago, Cleveland, Detroit, Louisville, Memphis, St. Louis and other cities. The relations of jobbers with manufacturers were prominently brought forward in a discussion of the recent action of the American Wheel Co., in making a heavy advance on the price of wheels. Some of the jobbers were strongly in favor of the adoption of a resolution pledging the members of the union to refrain from purchasing wheels from the American Wheel Co., and encouraging the formation of rival factories; but the majority were opposed to such action, believing that their true position lay in a policy that would excite no antagonisms. It was pointed out that the wheel manufacturers had for several years suffered from excessive competition, which had caused wheels to be sold under cost. The recent advance was, therefore, justified, and should not be condemned. It was insisted that the jobbers should not espouse the cause of the carriage makers and wagon builders, who were abundantly able to take care of themselves, and whose business was further known to be exceedingly prosperous, enabling them to easily pay a fair price for the materials which they used. The following officers were elected: S. D. Kimbark, of Chicago, President; Gaius Paddock, of St. Louis, Francis Boyd, of Milwaukee, and W. B. Dean, of St. Paul, Vice-Presidents; Charles T. Brace, of St. Louis, Secretary, and Robert E. Brier, of St. Louis, Treasurer.—[Iron Age.

THE Empire Zinc Co., of Joplin, Mo., is now completing arrangments to operate some of its mines by electric motor power.



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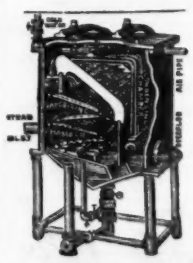
BASSETT, PRESLEY & TRAIN,

Cor. Elm & Hemlock Sts., CLEVELAND, O.



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Before you decide upon the adoption of any Feed-Water Heater and Purifier, or any device for assisting the circulation of steam for heating purposes, (after receiving full information of every device in the market) we would be pleased to call upon you personally (at our expense) and explain, with convincing proofs, the superiority of Webster's "Vacuum" Exhaust Steam Economizer over all pressure, coil, tubular or open heaters. Send for New Catalogue.

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PAGE.

Aluminum—
Cowles Electric Smelting & Aluminum Co., Cleveland ... 64
Bath Tubs—
‡Instantaneous Water Heating Co., Chicago, Ill ... 63
Bolts and Bolt Machinery—
Upson Nut Co., Cleveland ... 62, 80
†Seaton Manufacturing Co., Cleveland ... 43
Belt Holders—
*W. R. Santley & Co., Wellington, O ... 64
Boilers and Boiler Attachments—
Babcock & Wilcox Co., New York ... 72
Wm. B. Pollock & Co., Youngstown, O ... 71
E. H. Jones & Co., Cleveland ... 46, 61
Hazelton Tripod Boiler Co., Chicago ... 64
Blowers—
W. H. LaFountaine, Cleveland, O ... 71
Camp Stools—
Acme Manufacturing Co., Springfield, O ... 64
Coal and Coke—
Pittsburgh & Wheeling Coal Co., Cleveland ... 65
Cornice Work—
W. H. Mullins, Salem, O ... 63
Cranes and Derricks—
Wm. Tod & Co., Youngstown, O ... 70
Car Wheels—
Bowler & Co., Cleveland ... 66
Chain Belting—
Jeffrey Mfg. Co., Columbus, O ... 68
Carpet Cleaning & Laundry Machines—
W. H. LaFountaine, Cleveland, O ... 71
Damper Regulators—
*Curtis Regulator Co., Boston, Mass ... 70
Die Makers.
Avery Stamping Co., Cleveland ... 66
Drilling Machines—
Universal Radial Drill Co., Cincinnati, O ... 66
Drop Presses—
Toledo Tool & Machine Co., Toledo, O ... 64
Elevators—
L. S. Graves & Co., Rochester, N. Y ... 67
Explosives—
Hercules Powder Co., Cleveland ... 70
Electrical Manufactures—
†Cleveland Electrical Mfg. Co., Cleveland 61
Brush Electric Co., Cleveland ... 66
Elevator Buckets.
Avery Stamping Co., Cleveland ... 66
Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill ... 72
Emery Wheel Flanges—
*Edmund R. Ware, Chicago, Ill ... 62
Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland ... 69
Union Electrotype Foundry, Cleveland ... 64
Engines (Steam)
*Chandler & Taylor Co., Indianapolis, Ind. 66
Jas. Leffel & Co., Springfield, O ... 70
Wm Tod & Co., Youngstown, O ... 70
Skinner Engine Co., Erie, Pa ... 70
Aetna Machine Co., Warren, O ... 70
C. H. Presley, Cleveland ... 66
E. H. Jones & Co., Cleveland ... 61
Engines (Gas)—
Schleicher, Schumm & Co., Philadelphia, Pa. and Chicago, Ill ... 71
Van Duzen Gas Engine Co., Cincinnati, O ... 69
Engines (Hoisting)—
John F. Byers, Ravenna, O ... 61
Engines (Oil)
C. H. Presley, Cleveland, O ... 66
Engineers' Specialties—
*Curtis Regulator Co., Boston, Mass ... 70
Sensible Packing Co., Chicago, Ill ... 63
Engineers and Contractors—
E. H. Jones & Co., Cleveland ... 61
Ejectors—
James Jenks, Detroit, Mich ... 66
Files, Makers of—
Reynolds Bros., Columbus, O ... 72
A. & H. Gough, Cleveland ... 66
Parkin & Bosworth Co., Cleveland ... 72
Forges—
Cleveland City Forge & Iron Co., Cleveland 72
Foundries—
Bowler & Co., Cleveland ... 62 & 66
Thos. D. West. Foundry Co., Cleveland ... 68
Foundry Cupolas—
Victor Collian, Detroit, Mich ... 66
Frost Proof Steam Traps—
*Curtis Regulator Co., Boston, Mass ... 70
Furnace Feeders—
Brightman Stoker Co., Cleveland ... 70
Galvanizers.
Avery Stamping Co., Cleveland ... 66
Gas Machines—
Detroit Heating & Lighting Co., Detroit, Mich ... 63
Gear Cutters—
Palmer, Cunningham & Co., Philadelphia, Pa ... 66
Galvanized Iron—
*Cincinnati Corrugating Co., Piqua, O ... 61
Gum Roofing—
Gum Elastic Roofing Co., New York N. Y. 68
Grapples, Excavators and Dredges—
Jas. H. Lancaster, New York ... 69
Hose—
Fabric Fire Hose Co., New York ... 71
Heating and Ventilating Apparatus—
*Akron Heating & Ventilating Co., Akron, O ... 61
W. H. LaFountaine, Cleveland, O ... 71
Heaters and Purifiers—
Stilwell & Bierce Manufacturing Co., Dayton, O ... 72
Laidlaw & Dunn Co., Cincinnati, O ... 70
E. G. T. Colles & Co., Chicago ... 66
E. H. Jones & Co., Cleveland ... 61
Warren Webster & Co., Philadelphia, Pa. 43
Hangers—
W. H. LaFountaine, Cleveland, O ... 71
Injectors—
Columbia Injector Co., Cleveland ... 66
Penberthy Injector Co., Detroit, Mich ... 72
Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O ... 71
Cambridge Iron Roofing Co., Cambridge, Ohio ... 71
Garry Iron Roofing Co., Cleveland ... 71
Standard Iron Co., Bridgeport, O ... 71
Thompson Manufacturing Co., Cleveland, 71
Berger Mfg. Co., Canton, O ... 71
Eberts Bros., Detroit, Mich ... 72
Kanneberg Roofing Co., Canton, O ... 71
Iron Ore, Bar and Pig Iron—
Dalliba, Corrigan & Co., Cleveland ... 65
Oglebay, Norton & Co., Cleveland ... 65
J. H. Outhwaite & Co., Cleveland ... 65
Condit-Fuller Co., Cleveland, O ... 65
Pickands, Mather & Co., Cleveland ... 65
H. N. Hill & Co., Cleveland ... 65
E. C. Pope, Cleveland ... 65
Cleveland Iron Mining Co., Cleveland ... 65
Lathes—
H. L. Shepard, Cincinnati, O ... 66
Lathe Dogs—
Palmer, Cunningham & Co., Philadelphia 66
Manufacturing Sites—
B. C. Washington, Wheeling, W. Va ... 61
Mining Machinery—
Webster, Camp & Lane Machine Co., Akron, O ... 62, 68
*Copeland & Bacon, New York ... 70
Machine Shops—
Webster, Camp, & Lane Machine Co., Akron, O ... 62, 68
Toledo Machine & Tool Co., Toledo, O ... 64
Machinists' Tools and Supplies—
Parkin & Bosworth, Cleveland ... 62 & 72
Garvin Machine Co., New York ... 66
C. H. Presley, Cleveland, O ... 66
Oil Fuel Process—
Aerated Fuel Co., Springfield Mass ... 67
Ore Separators—
H. E. Collins & Co., Pittsburgh, Pa ... 64
Patents—
Wm. M. Monroe, Cleveland ... 68
*Thos P. Simpson, Washington, D. C ... 68
Patterns—
Gobeille Pattern Co., Cleveland, O ... 67
Pumps (Steam)—
Laidlaw & Dunn Co., Cincinnati, O ... 70
Rumsey & Co., Seneca Falls, N. Y ... 70
Van Duzen & Tift, Cincinnati, O ... 61
E. H. Jones & Co., Cleveland ... 61
Printing Inks—
Ault & Wiborg, Cincinnati, O ... 62
Paint—
Iron Clad Paint Co., Cleveland, O ... 66
Akron Chemical Co., Akron, O ... 64
Ullman & Philpot Mfg. Co., Cleveland ... 62
Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill ... 64
Pulleys—
Ohio Pulley & Machine Co., Warren, O ... 66
Pipe Cutting & Threading Machines—
*Wells Machine Works, Fostoria, O ... 44
Packing—
Sensible Packing Co., Chicago, Ill ... 63
Pipe Fittings—
Isaac B. Potts Pipe Fitings Co. Columbus, O ... 71
Punches and Shears—
Long & Allstatter Co., Hamilton, O ... 66
Pipe and Boiler Coverings—
American Heat Insulating Co., Pittsburgh 69
Rolls and Pinions—
Totten & Hogg Iron & Steel Foundry Co., Pittsburgh, Pa ... 72
Railroads—
Time Tables, Etc ... 69
Railway Supplies—
Bowler & Co., Cleveland ... 62, 66
Cleveland City Forge & Iron Co., Cleveland ... 72
Rivet Machinery—
†Seaton Manufacturing Co., Cleveland ... 43
Rock Breakers and Ore Crushers—
Jas. H. Lancaster, New York ... 69
Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland ... 62, 65
Saws—
Peter Gerlach & Co., Cleveland ... 64
Detroit Saw Works, Detroit, Mich ... 64
Shafting—
Fitzsimons & Co., Cleveland ... 72
*Brightman Machine Co,, Cleveland ... 62
Shapers—
*J. Steptoe & Co., Cincinnati, O ... 72
Steam Heating Apparatus—
*Curtis Regulator Co., Boston, Mass ... 70
Detroit Heating & Lighting Co., Detroit, Mich ... 63
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn ... 65
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland ... 62
F. A. Sackman, Cleveland, O ... 68
Jas. Murdock Jr., Cincinnati, O ... 72
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland ... 62, 65
Cambridge Iron & Steel Co., Cambridge, O 65
Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa ... 71
Sheet Steel—
Standard Iron Co., Bridgeport, O ... 71
Cambridge Iron & Steel Co., Cambridge, O 65
Stampers of Sheet Metal—
Avery Stamping Co., Cleveland ... 66
Stokers—
Brightman Stoker Co., Cleveland ... 70
Stove Pipe Crimpers—
Acme Manufacturing Co., Springfield, O ... 64
Tinning Steel, Etc.
Avery Stamping Co., Cleveland ... 66
Twist Drills—
Cleveland Twist Drill Co., Cleveland ... 72
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland ... 72
Water Gas Furnaces—
W. S. Hutchinson, Chicago, Ill ... 72
Window Blinds—
Hartman & Durstine, Wooster, O ... 65
Wire Goods—
*F. Powell & Co., Toledo, O ... 72
Wire Machinery—
John Adt & Son, New Haven, Conn ... 66
Wire Nails—
Salem Wire Nail Co., Salem O ... 67
Wood-Working Machinery—
Indiana Machine Work, Ft. Wayne, Ind ... 64, 68
Egan & Co., Cincinnati, O ... 71
G. H. Scanlan & Co., Portland, Me ... 62
*Battle Creek Machinery Co., Battle Creek, Mich ... 62
Wheelbarrows—
*Cleveland Wheelbarrow & Truck Co,, Cleveland ... 72

List of Advertisements Appearing only in this Issue.

W. J. Hilands, Cleveland ... 57
Millett Core Oven Co., Brightwood, Mass ... 57
Runyon Stubbs & Mack, Cleveland ... 58
Ford & Waseburn Electric Co., Cleveland ... 59
Chas H Potter & Co, Cleveland ... 59
State National Bank, Cleveland ... 52
Andrews Hitchcock & Co Cleveland ... 61
Eclipse Electro & Eng. Co., Cleveland ... 60
The Parkin & Bosworth Co., Cleveland ... 60
Eureka Tempered Copper Co., North East, Pa ... 60
Pickands Mather & Co., Cleveland ... 73
Straub Machinery Co, Cincinnati, O ... 61
Cincinnati Milling Machine Co., Cin., O ... 62
P. L. Sword & Son, Cleveland ... 63
Howell Wheel Co, Covington, Ky ... 63
Graham Twist Drill Co., Detroit, Mich ... 63
J. H. Day & Co., Cincinnati O ... 64
Fuller Bros, Cleveland ... 67
Chas. G. Eddy, Roanoke, Va ... 74
National Photo Eng. Co., Cleveland ... 75
Claflen Paving Co., Cleveland ... 75
Albion Stone Co, Cleveland ... 75
Hill Clutch Works, Cleveland ... 50
Hackney Hammer Co, Cleveland ... 50
Walker Manufacturing Co. Cleveland ... 51
Gaulds Manufacturing Co., Seneca Falls, N. Y ... 52
Cleveland Iron Mining Co., Cleveland ... 52
Central Thomson-Houston Co., Cleveland ... 52
E. C. Pope, Cleveland ... 53
Cleveland Supply Co., Cleveland ... 53
Silsby Manufac uringCo., Seneca Falls N.Y. 53
Avery Stamping Co., Cleveland ... 54
Britton Rolling Mill Co., Cleveland ... 54
Geo. P. Burwell, Cleveland ... 55
S. E. Tatum & Co., Cincinnati, O ... 55
Cleveland Desk Co., Cleveland ... 55
Union Photo Eng Co., Cleveland ... 56
Campbell Ptg. Press Mfg. Co., New York ... 56
Gobeille Pattern Co, Cleveland ... 56
Union Rolling Co., Cleveland ... Cover
Condit Fuller & Co., Cleveland ... "
Taplin Rice & Co., Akron ... "
W. J. Morgan & Co., Cleveland ... "
Oglebay, Norton & Co., Cleveland ... 76
Tod, Stambaugh & Co., Cleveland ... 76
Hollenden, Cleveland ... 77
M. A. Hanna & Co., Cleveland ... 78
Maher & Brayton, Cleveland ... 79
Upson Nut Co, Cleveland ... 80
Cleveland Rolling Mill Co., Cleveland ... Cover
Globe Iron Works Co., Cleveland ... 1
Ingersoll Milling Machine Co., Cleveland ... 2
Detroit Heating & Lighting Co., Detroit ... 3
Brush Electric Co., Cleveland ... 4
Bassett, Presley & Train, Cleveland ... 43
Card Elec. Motor & Dynamo Co., Cin ... 45
Osborn Mfg. Co., Cleveland ... 47
E. H. Jones & Co., Cleveland ... 47
Geo. C. James & Co., Cincinnati, O ... 47
Garvin Machine Co., New York ... 48
J. W. Vanderwerf, Cleveland ... 48
Akron Belting Co., Akron ... 43
Rice & Blunt, Detroit ... 46
Wyckoff Seamens & Benedict, Cleveland ... 46
Industry File Works, Cleveland ... 6
C. D. Dodge, Lansing, Mich ... 49
G. W. Lord, Philadelphia, Pa ... 49
D. K. Norton, Cincinnati, O ... 49

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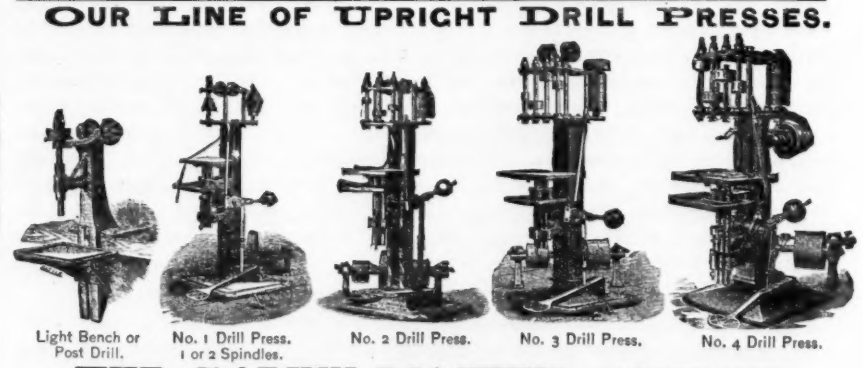

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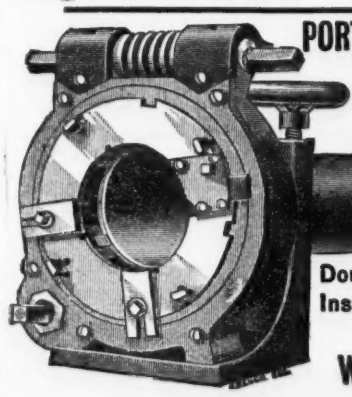

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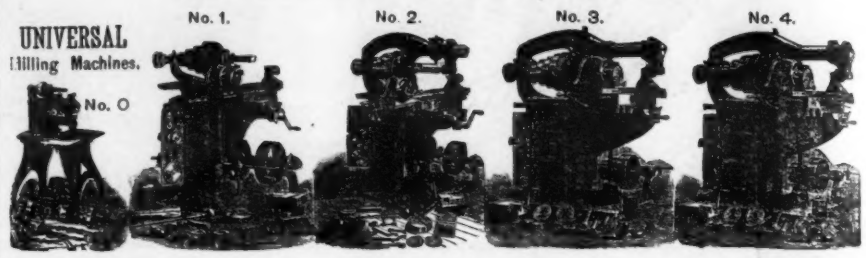

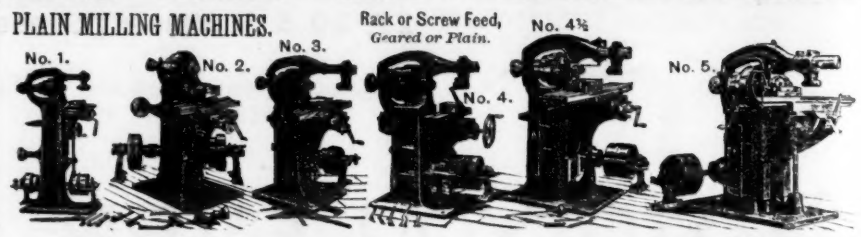

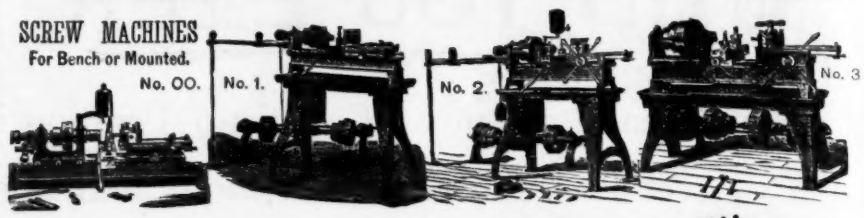

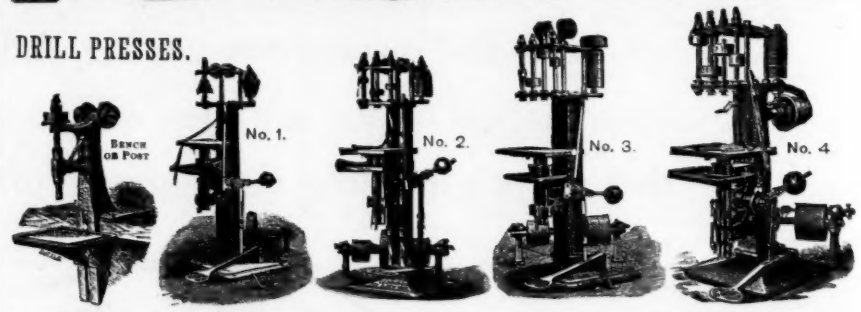

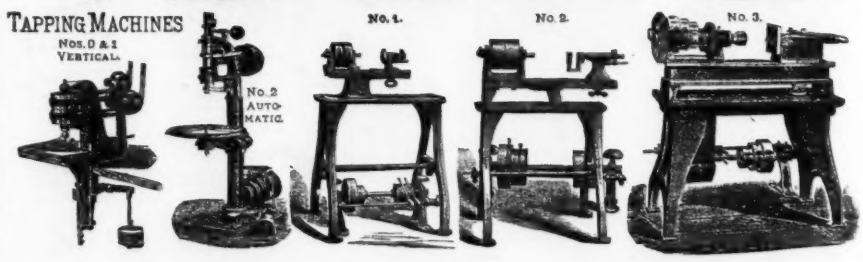

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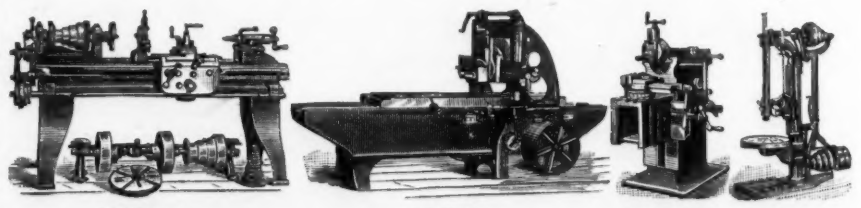

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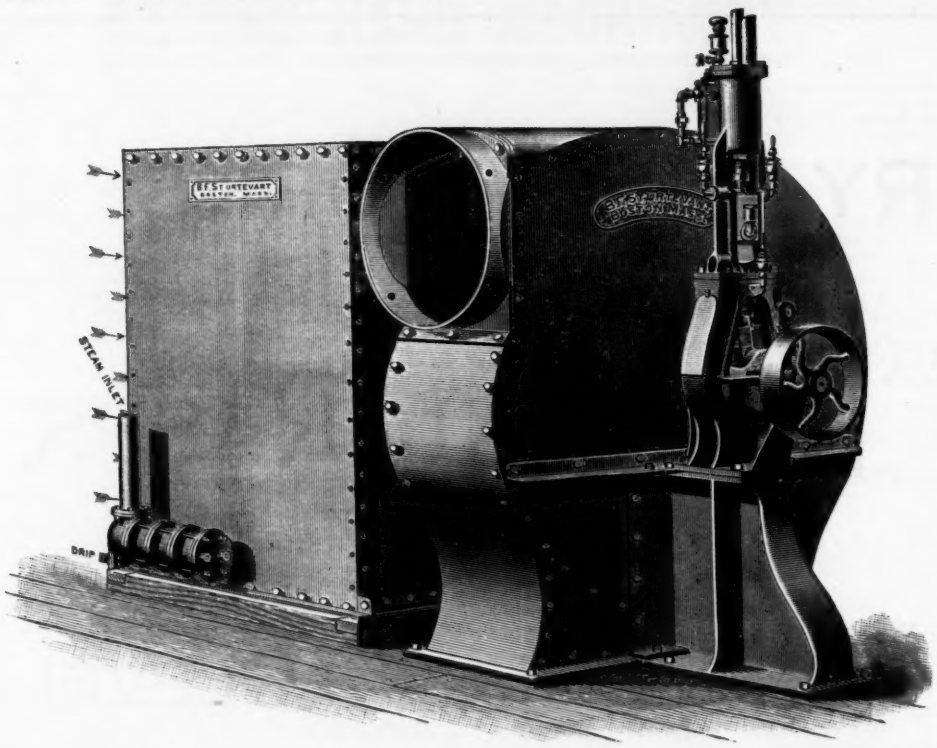

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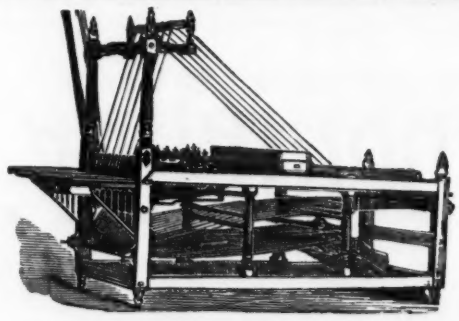

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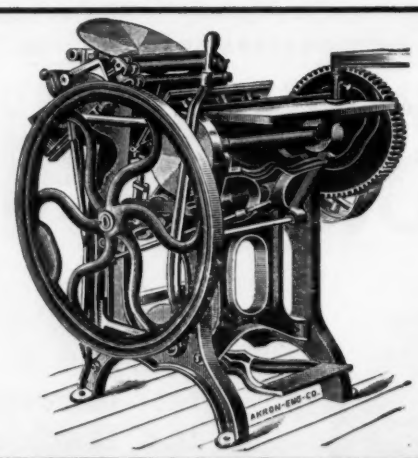

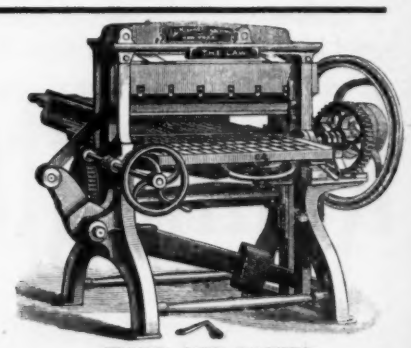

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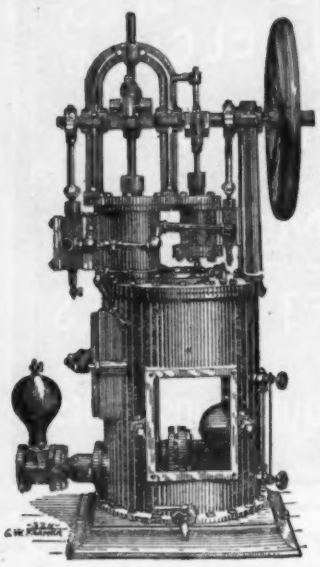

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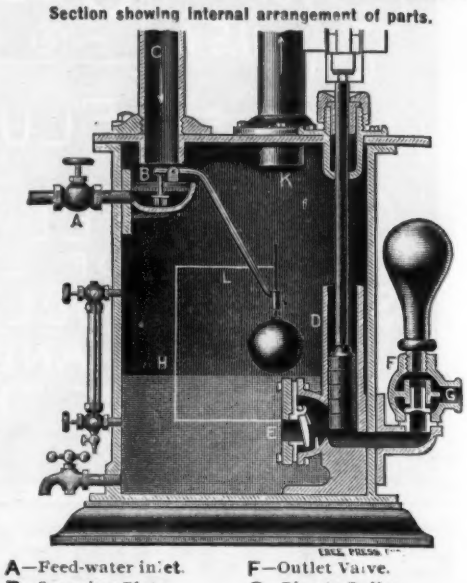
Section showing internal arrangement of parts.



A—Feed-water inlet.
B—Spraying Plate.
C—Exhaust from Engine.
D—Pump.
E—Suction Valve.
F—Outlet Valve.
G—Pipe to Boiler.
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Saves Fuel and Water and reduces back pressure on the Engine.

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We call attention to the following list of second-hand machinery partially described. We are constantly exchanging machinery with our customers. All this second hand machinery is thoroughly refit and put in good, reliable working order. The boilers are thoroughly tested and certificates furnished, are cleaned and painted. The engines, after being refit, have all the bright parts polished when so stated, and the other parts of the engines painted in good shape. If a suitable selection can be made, we can recommend the machinery all right, and have placed the figures low, everything considered. Write for particulars of the outfit wanted. We will furnish any engine and any boiler selected at the combined prices of the boiler and engine given in this sheet, and include injector and connection.

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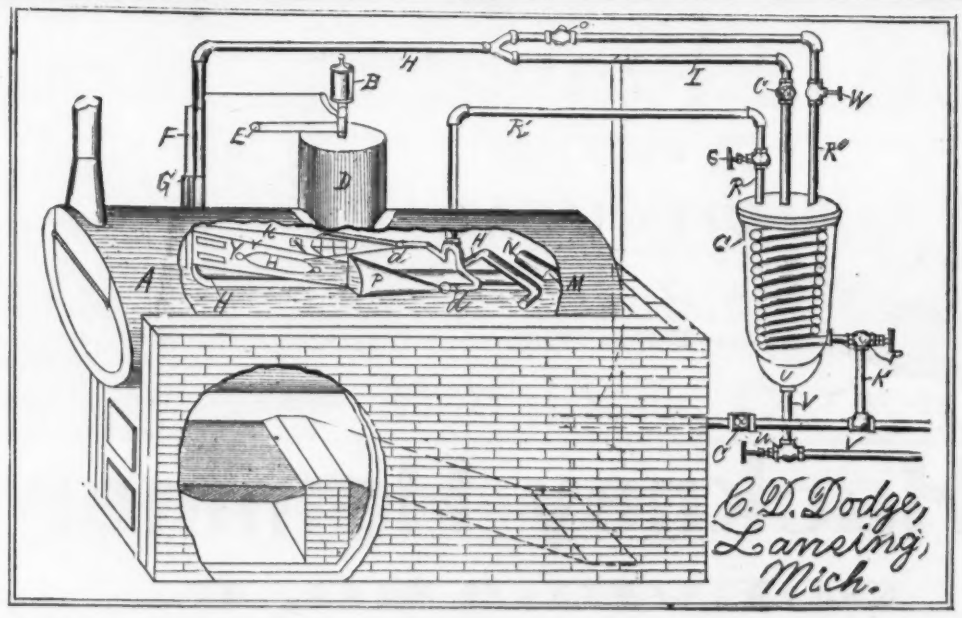

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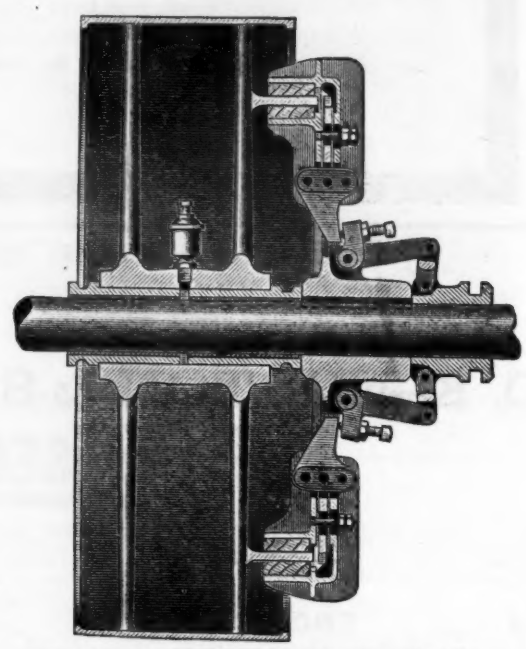

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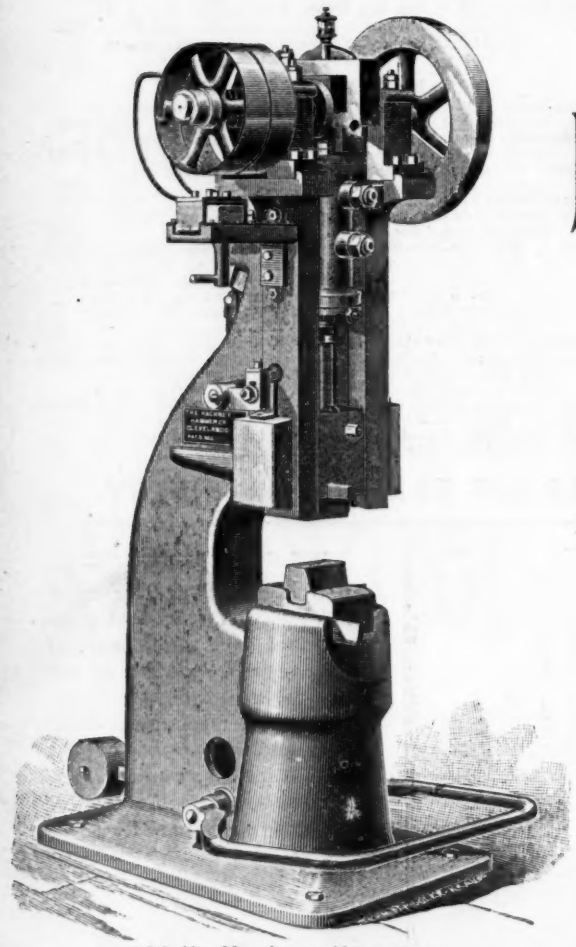

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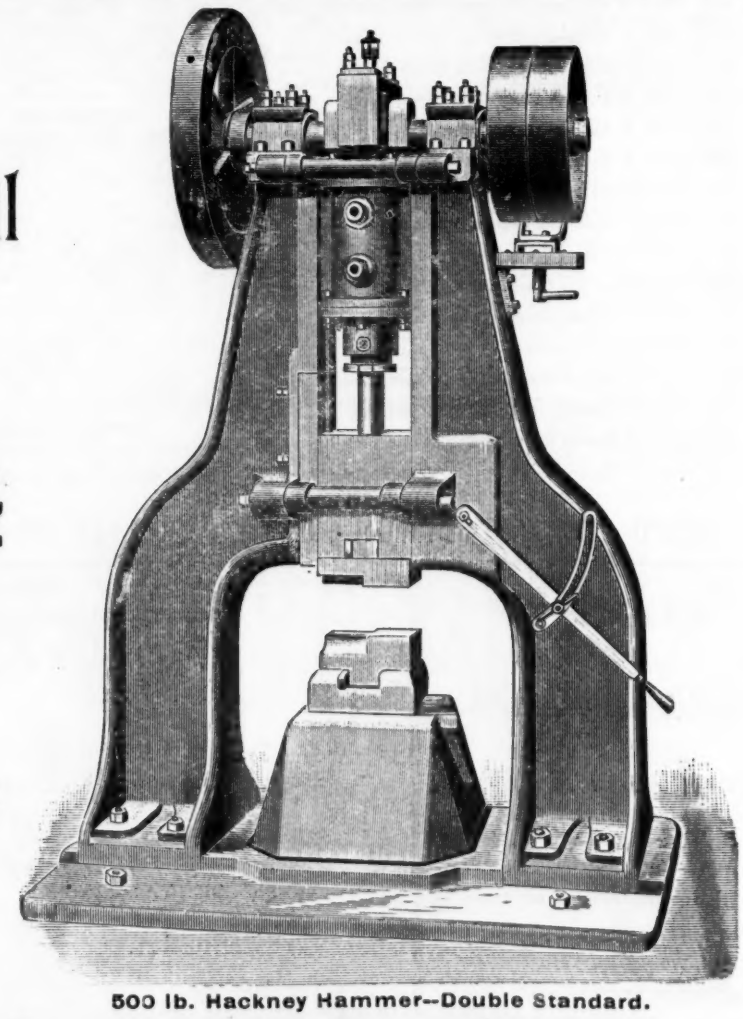

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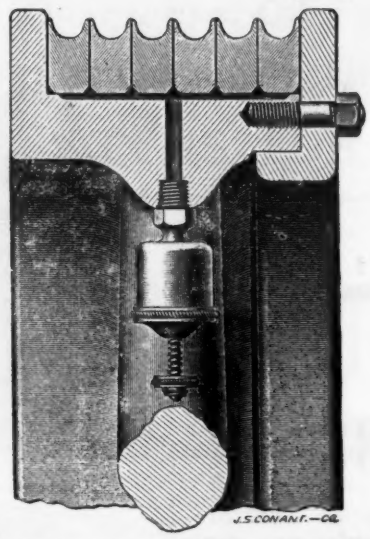

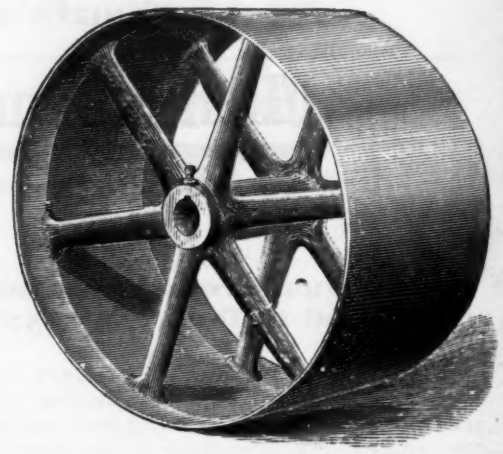

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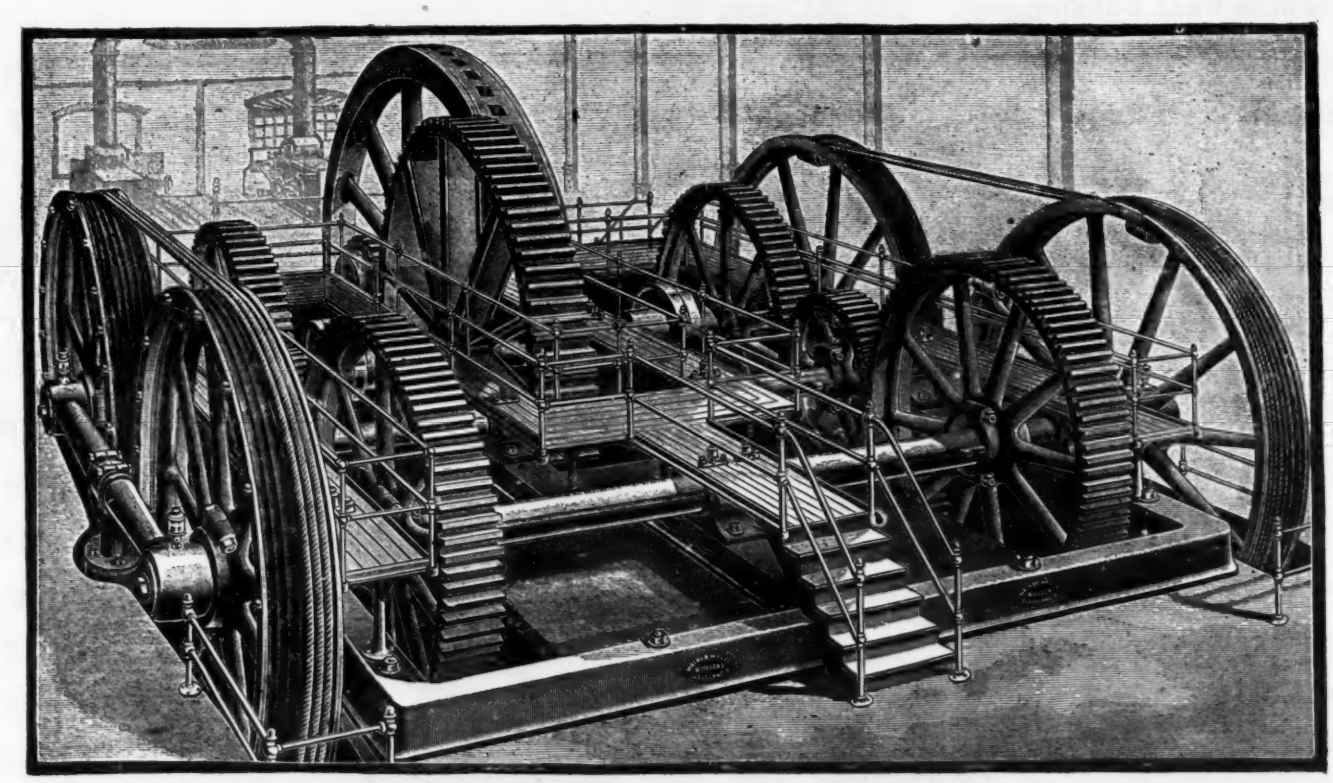

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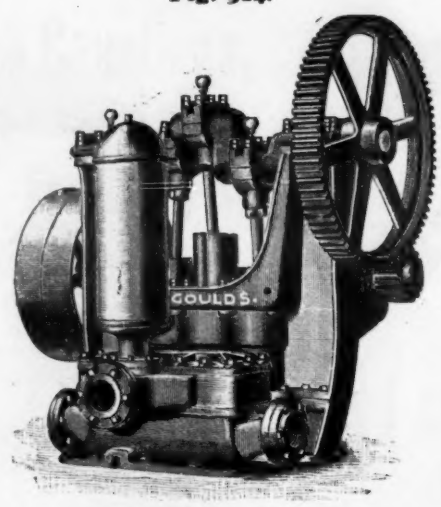

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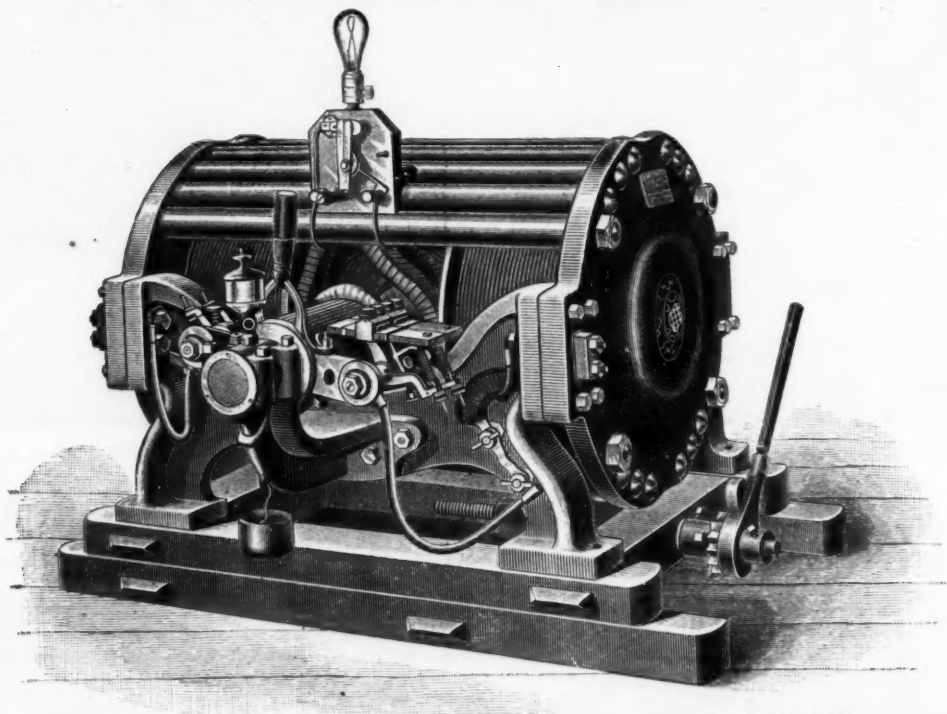

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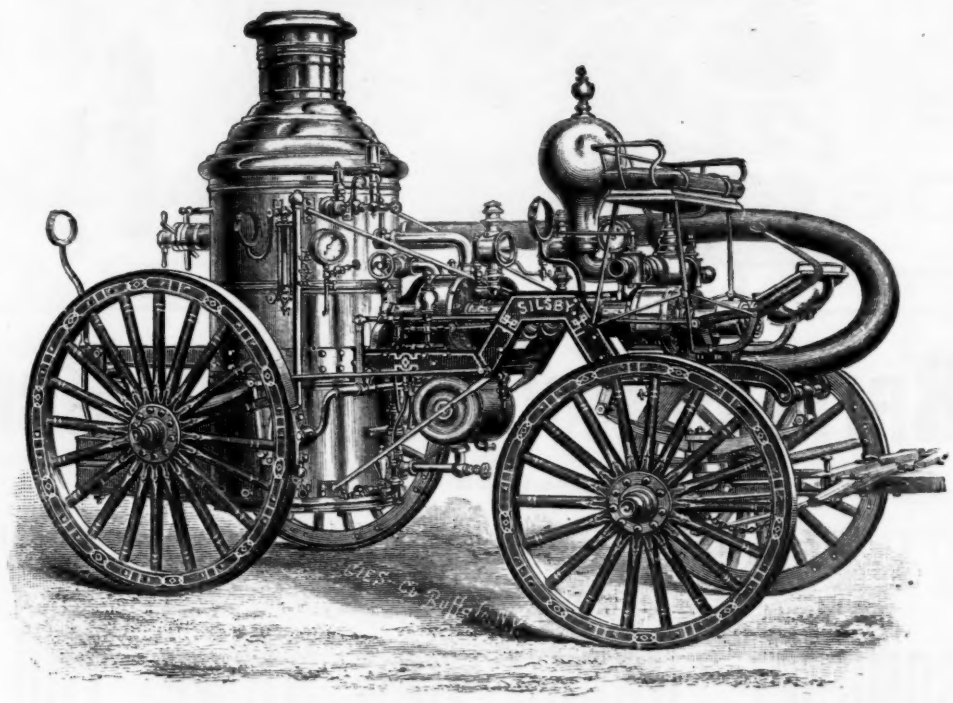

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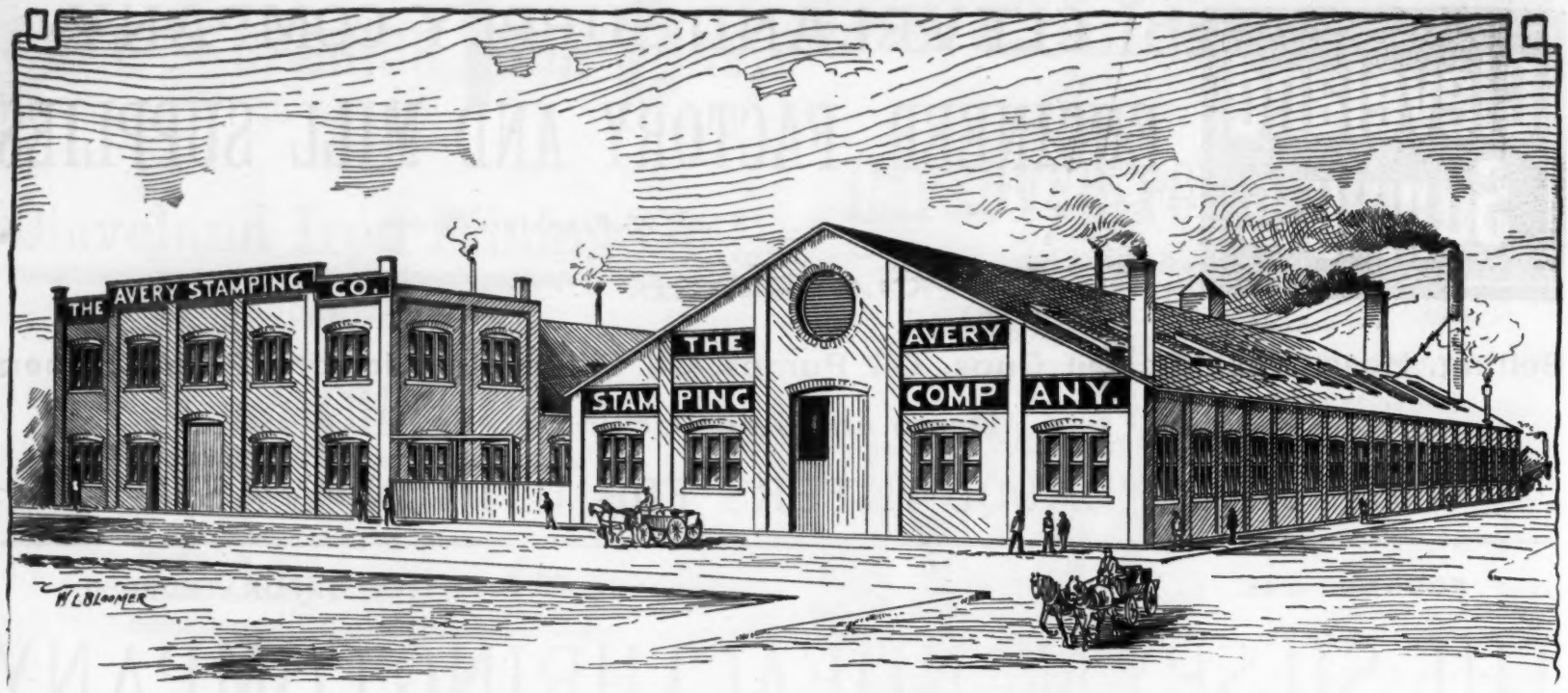

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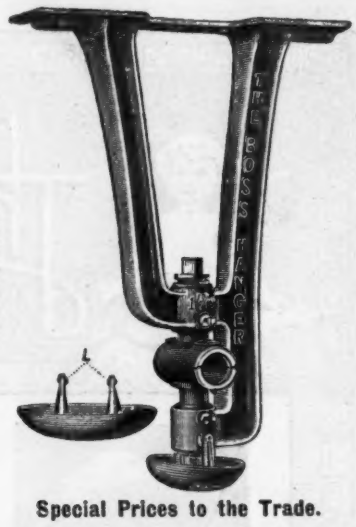

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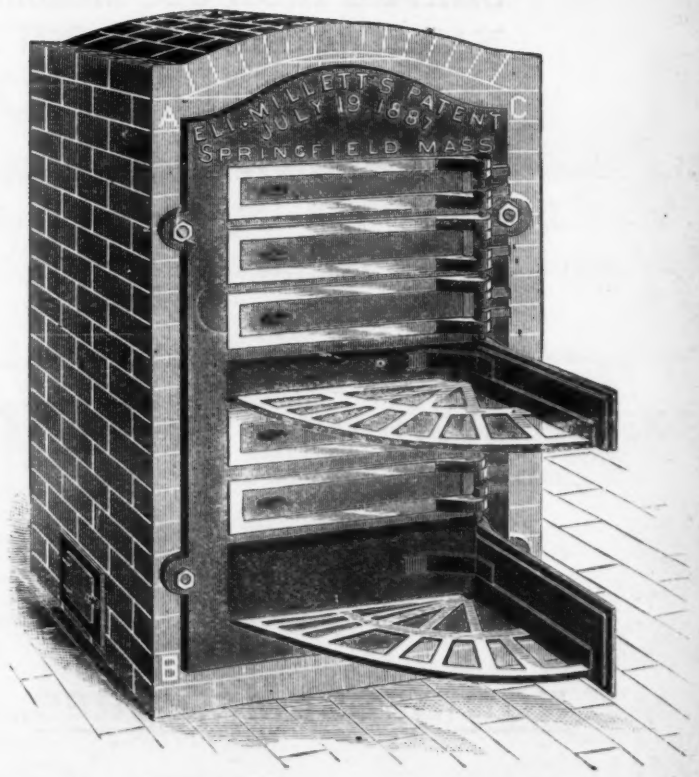

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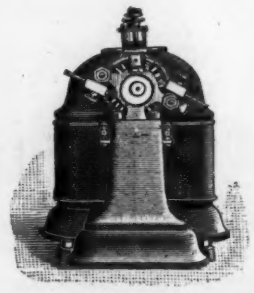

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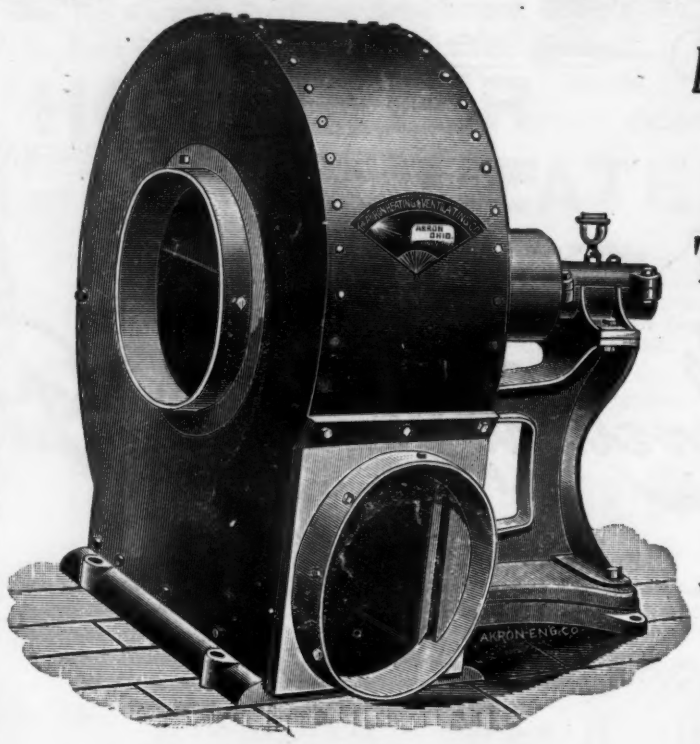

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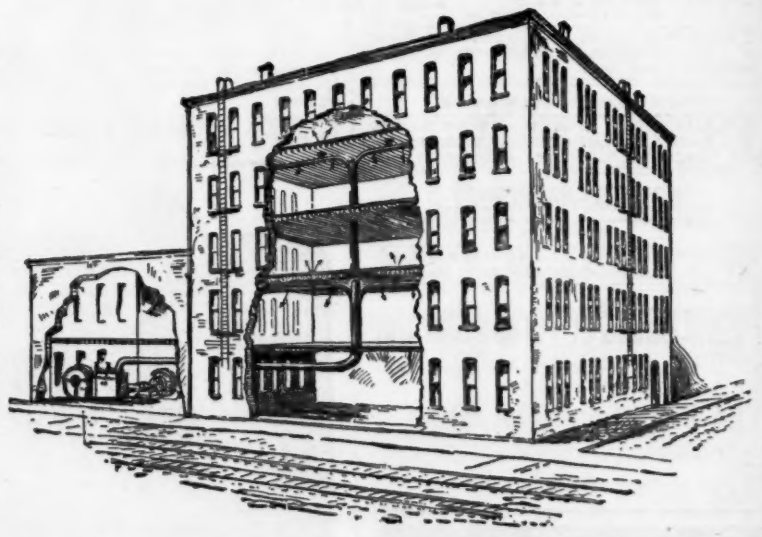

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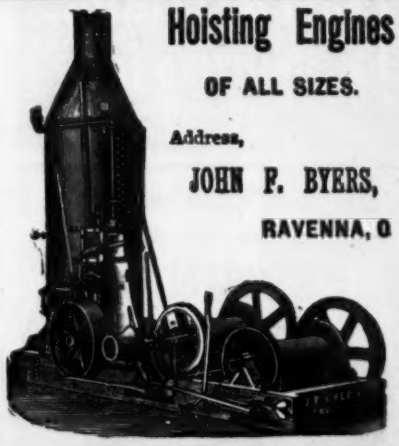

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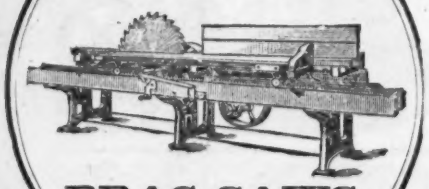

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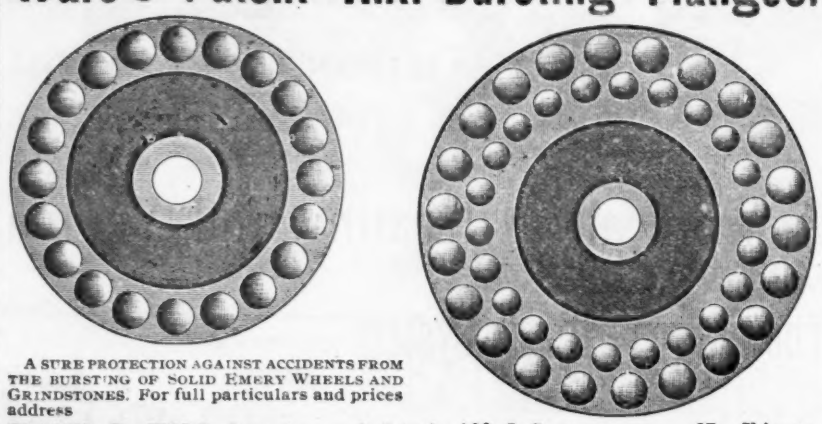

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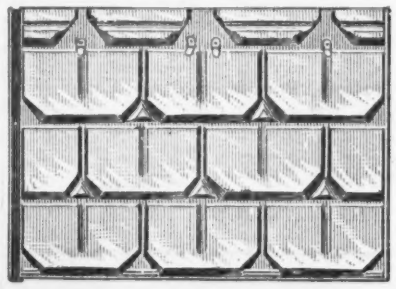

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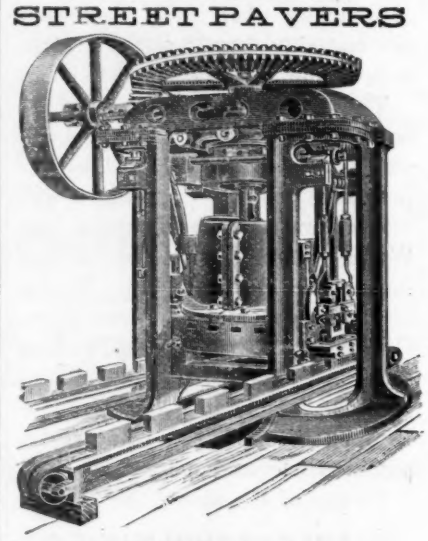

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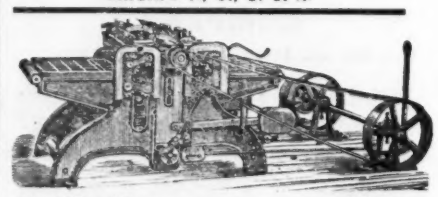

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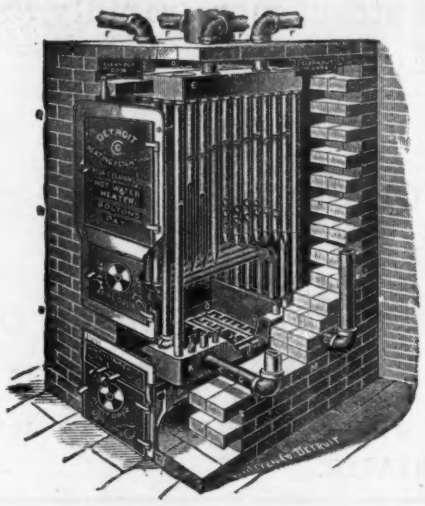

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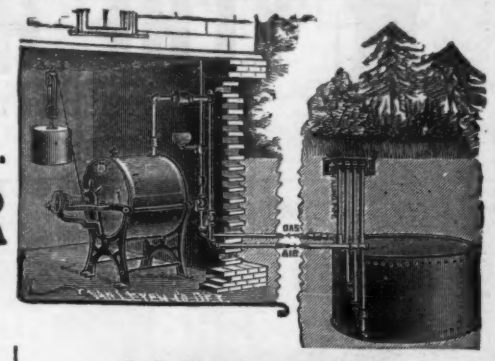

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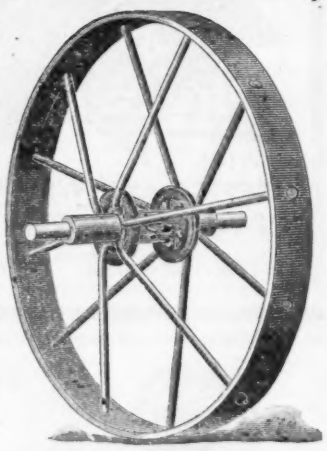

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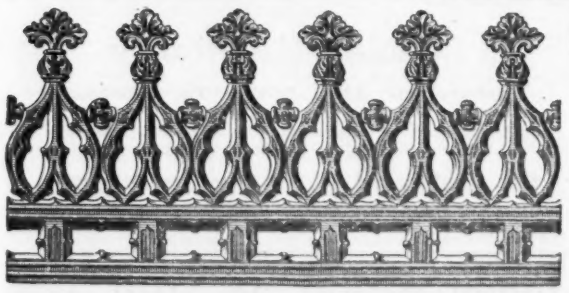

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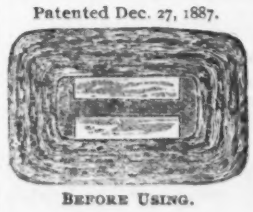

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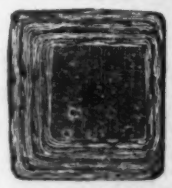

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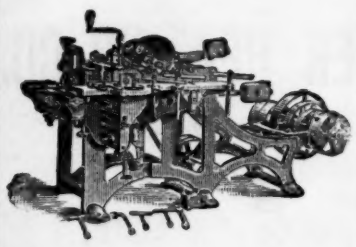

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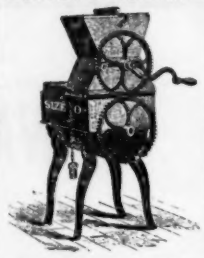

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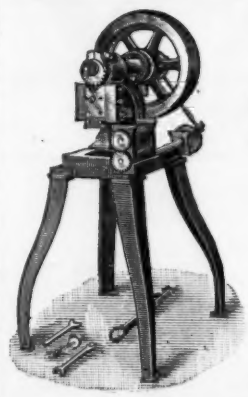

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CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1. foundry, $16 25 @17 00; Southern Coke No. 2 Foundry, $15 50 @16 50; Southern Coke No. 3 Foundry, $15 00 @16 00; Southern Coke No 1, Softeners, $15 50 @16 50; Southern Coke No. 2, Softeners, $14 75 @15 50; Ohio Silveries No. 1, $18 00@18 75; Ohio Silveries No. 2, $17 00@ 17 75; Ohio Strong Softeners No. 1, $18 25@19 50; Ohio Strong Softeners No. 2, $17 50@18 75; Lake Superior Charcoal Nos. 1 to 6, $19 00@20 00; Tennessee Charcoal No. 1, $19 00@20 00; Tennessee Charcoal No. 2, $18 00@19 00; Southern Standard Car Wheel, $22 00@24 50; Tennessee Standard Car Wheel, $19 50@20 50.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $15 25@15 75; Hanging Rock Coke, No. 1 foundry, $17 00@18 00; Jackson Co. Stone Coal, No. 1 foundry, $17 00@17 50; Tennessee Charcoal, No. 1 foundry, $17 00@18 00; Hanging Rock Charcoal, No. 1 foundry, $21 00 @22 00. MILL IRONS—Standard Southern Coke, grey forge, $13 25@13 50; Standard Southern Coke, mottled, $12 75@13 00; Cold Short Southern Coke, grey forge, $13 00@13 50; Strong Ohio Neutral Coke, grey forge, $15 50@16 00. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $21 00@22 00; Tennessee Car Wheel, $20 00@20 50; Lake Superior Car Wheel, $20 50@21 50.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $17 50@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $16 50 @00 00; Ohio Softener No. 1, $17 50@00 00; Ohio Softener No. 2, $16 50@ 00 00; Jackson Co. Silveries, $18 00@19 00; Lake Superior Charcoal, $20 50@21 00; Tennessee Charcoal, $19 50@00 00; Southern Softener No. 1, $16 50@00 00; Southern Softener No. 2, $15 75@00 00; Southern Strong No. 1 Foundry, $17 00@00 00; Southern Strong No. 2 Foundry, $16 50@00 00; Alabama Car Wheel, $23 00@24 00; Hanging Rock Charcoal, $23 00@24 00.

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1, $15 00@15 25; Southern coke No. 2, $14 25@14 50; Southern coke No. 3, $14 00@14 25; Mahoning Valley (Lake ore mixtures), $17 75@18 75; Southern charcoal, No. 1, $17 00@17 50; Southern charcoal, No. 2, $16 50@17 00; Missouri charcoal No. 1, $18 00@18 50; Missouri charcoal, No. 2, $17 00@17 50. FORGE—Neutral coke, $13 75@14 00; Cold short, $13 75@14 00; Mottled, $12 75@13 25. CAR WHEEL AND MALLEABLE—Southern (standard brands), $22 00@ 23 00; Southern (other brands), $18 00@19 00; Lake Superior, $22 50@23 00.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 75@16 25; Southern Coke No. 2, $14 75@15 25; Southern Coke No. 3, $14 25@14 75; Southern Grey Forge, $13 75@ 14 25; Southern Charcoal No. 1, $17 50@18 00; Southern Charcoal No. 2, $17 00@17 50; Missouri Charcoal No. 1, $16 00@16 50; Missouri Charcoal No. 2, $15 50@16 00; Ohio Softeners, $18 00@ 19 50. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $21 75@22 25; Southern, $19 00@ 22 50. CONNELLSVILLE COKE—East St. Louis, $5 65; St. Louis, $5 80.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $19 50@20 50; Lake Superior (coke) Bessemer, $18 50@18 75; Katahdin (Maine charcoal), $23 50 @24 00; Lake Superior Coke, Foundry, all ore, $18 00@19 00; Lake Superior Coke, Foundry Cinder Mixed, $00 00@00 00; Standard Ohio Black Band, $18 25@18 75; Southern No. 1, $16 00@.6 50; Southern Gray Forge, $14 25@ 14 75; Jackson County (Ohio) Silvery. $18 50@ 19 00; Old Car Wheel, $00 00@00 00. Connellsville Coke, $4.80.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry $14 75@ 15 25; Southern Coke No. 2 Foundry $14 25@ 14 75; Southern Coke No. 3 Foundry $13 75@ 14 25; Grey Forge, $13 25@13 75; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $17 50@18 50; Southern Car Wheel, Standard brands, $22 50@23 50.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $17 00@17 25; No. 2 Foundry, $16 00@16 25; Grey Forge, $15 00@15.25; White and Mottled, $14 00@14 25; Warm Blast Charcoal, $18 00@21 00; Cold Blast Charcoal $23 00 @27 00; Bessemer, $17 00@17 50.

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Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 95
4½ to 6 by ⅜ to 1 inch	2 05
1½ to 6 by 1¾ to 2 inch	2 35
1½ & 1¾ by ⅜ to ¾ inch	2 05
1 & 1¼ by ⅜ to ¾ inch	2 15
⅝, ¾ and ⅞ by ⅜ to ⅝ inch	2 35

Round and Square.

1 to 1⅞ inch	1 95
2 to 3½ inch	2 15
2¼ to 3¼ inch	2 45
3⅜ to 4 inch	2 95
4⅛ to 4½ inch	3 45
4¾ to 5 inch	3 65

Oval.

⅜ to 1¼ inch	2 35
½ to ¾ inch	2 55
⅞	2 75
1	3 15

Half Oval and Half Round.

1¼ to 3 inch	3 05
⅜ to 1¼ inch	2 65
½ to ¾ inch	3 25
⅞	3 45
1	4 95

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	2 15
1 to 1¾ by ¼ and 5-16 inch	2 25
¼ to ⅝ by ¼ and 5-16 inch	2 45
½ to ⅝ by ½ and 5-16 inch	2 95

Hoops.

1¼ to 4, Nos. 13 to 15	2 75
1¼ to 2, Nos. 16 to 18	2 85
1¼ to 2, No. 19	2 95
1¼ to 2, No. 20	3 05
1¼ to 2, No. 21	3 15
1¼ to 2, No. 22	3 25
15-16, 1 and 1⅛, Nos. 13 to 15	2 95
15-16, 1 and 1⅛, Nos. 16 to 18	3 05
15-16, 1 and 1⅛, Nos. 19 and 20	3 15
15-16, 1 and 1⅛, No. 21	3 25
15-16, 1 and 1⅛, No. 22	3 35
⅞, Nos. 13 to 15	3 15
⅞, Nos. 16 to 18	3 25
⅞, Nos. 19 and 20	3 35
⅞, No. 21	3 45
⅞, No. 22	3 55
13-16, Nos. 13 to 15	3 35
13-16, Nos. 16 to 18	3 45
13-16, Nos. 19 and 20	3 55
13-16, No. 21	3 65
13-16, No. 22	3 75
¾, Nos. 13 to 15	3 45
¾, Nos. 16 to 18	3 65
¾, Nos. 19 and 20	3 75
¾, No. 21	3 85
¾, No. 22	3 95
11-16, Nos. 13 to 15	3 65
11-16, Nos. 16 to 18	3 85
11-16, Nos. 19 and 20	3 95
11-16, No. 21	4 05
11-16, No. 22	4 15
⅝, Nos. 13 to 15	3 95
⅝, Nos. 16 to 18	4 15
⅝, Nos. 19 and 20	4 25
⅝, No. 21	4 35
⅝, No. 22	4 45
⅝, No. 23	4 65

Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 35
1¼ to 6 by Nos. 11 and 12	2 45
1 to 1¾ by ⅛ to 3-16 in	2 55
1 to 1¾ by Nos. 11 and 12	2 65
¾ and 13-16 by ⅛ to 3-16 in	2 85
¾ and 13-16 by Nos. 11 and 12	2 95
¾ and 11-16 by ⅛ to 3-16 in	3 15
¾ and 11-16 by Nos. 11 and 12	3 25
⅝ and 9-16 by ⅛ to 3-16 in.	3 45
⅝ and 9-16 by Nos. 11 and 12	3 55
½ by ⅛ to 3-16 in	3 75
½ by Nos. 11 and 12	3 85

Wagon Box Iron.

⅛ inch, beveled edge, by Nos. 11 and 12	2 95
⅛ inch, " " " 13 and 14	3 15
¼ inch, " " " 11 and 12	3 25
¼ inch, " " " 13 and 14	3 45

Sheet Iron.

No. 10 to 14	2 65
No. 15 to 17	2 80
No. 18 to 21	3 00
No. 22 to 24	3 20
No. 25 to 26	3 35
No. 27	3 45
No. 28	3 55

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 80
C No. 1, " "	3 05
C H No. 1 " "	3 30
C H Flange, " "	4 05
Extra Flange, "	4 55
Solid Fire Box "	5 30

Steel Boiler Plates—1-4 in. and Heavier.

Tank	3 00
Shell	3 40
Flange	3 70
Marine Flange	4 10
Fire Box	4 80

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c lb extra
96 to 100 in. wide	½c "
100 to 104 in. wide	¾c "
104 to 116 in. wide	special

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1 to 2 in. inclusive	09
9-16 to ⅞ in "	09
7-16 to ⅝ and 2⅝ to 3 in	10⅓
3⅛ to 4 in	11
⅝ to 11-16 and 4⅛	10⅓
⅛ to 6 in	11⅓
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. lbs
2 to 9-16 wide by 2 to ⅛ thick	9

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Machinery	base price, 3 00
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Jessop's	16c
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Cast borings	9 00
Uncut wrought iron boilers	13 00
Steel boiler plates	17 00
Grate Bars	9 00
Pipes and flues (Clean)	13 50
Tank iron	13 50
Hoop and band iron	10 00
Sheet iron	9 50
Wrought drillings	11 50
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Stove Plate	8 75
Machine Castings	11 00
Hoop and Sheet	8 00
Casting Borings	9 00
Wrought Turnings	12 00

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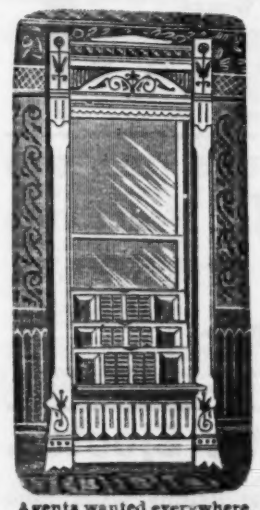

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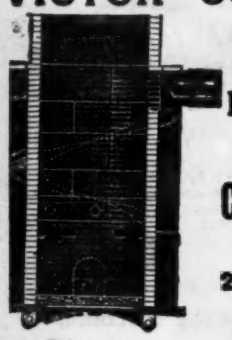

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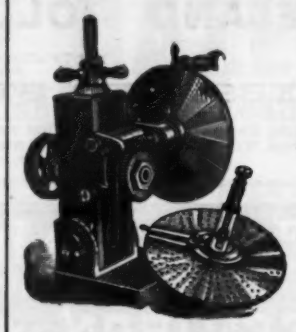

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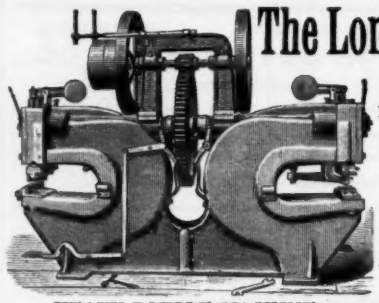
USED BY NEARLY ALL THE RAILROADS



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Double, Single, Angle-Bar, Gang, Horizontal, Twin, Boiler, Spacing, Gate, Multiple, Belt and Steam Driven
PUNCHES AND SHEARS.
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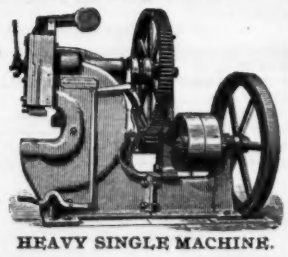
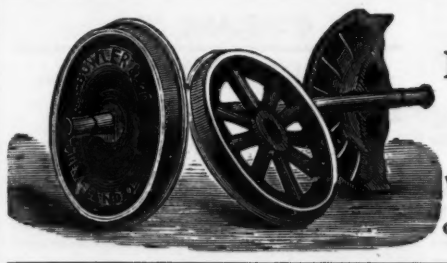


HEAVY DOUBLE MACHINE. HEAVY SINGLE MACHINE.



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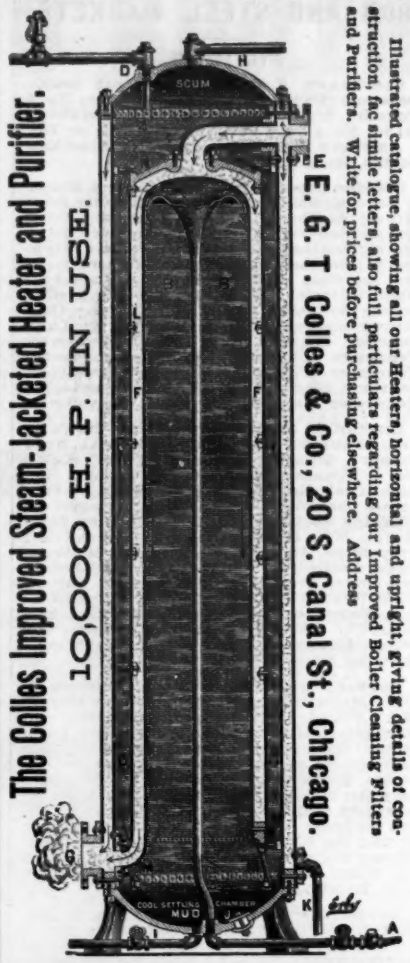

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Steam Jet Pumps,	From	$4.00 up.
Automatic Injectors,	"	$5.00 up.
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OIL ALWAYS BELOW BURNERS---BY USING OUR SYSTEM.
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WE GUARANTEE INSURANCE WHEN PLANT IS INSTALLED ACCORDING TO OUR SPECIFICATIONS.

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425 MAIN STREET, SPRINGFIELD, MASS.

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HARDWARE MARKET.

Augers and Bits.

Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ℔ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ℔ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....℔ doz $8 00
Others.....℔ doz $7 00
Full polished.....℔ doz $9 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 70&10&5
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Rnds.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&5
Loose joint, jap.....dis 70&5
Loose joint, jap. with acorns.....dis 70&5
Loose pin, acorns.....dis 70&5
Loose pin, japanned acorns.....dis 70&5
Loose pin, acorns, jap. plated tips.....dis 70&5
Wrought steel—
Wrought, fast joint, narrow.....dis 70&5
Wrought, fast joint, broad.....dis 70&5
Wrought, loose joint, broad.....dis 70&5
Table Butts, back flaps, etc.....dis 70&5
Regular inside blind.....dis 70&5
Light inside blind.....dis 70&5
Loose pin.....dis 70&5
Light loose pin.....dis 70&5

Carbonized Felt and Building Papers.

(POWERVILLE BRAND.)

	Per roll of 500 sq. feet.
Eberts Bros., Detroit.	
No. 1—Sisters'	$1.25
"A," Stringed Roofing, Light.	1.50
"B," Stringed Roofing, Medium	1.75
"C," Stringed Roofing, Heavy	2.00
Stringed, Rosin-Sized	1.00

MILCELLANEOUS.

Asphaltum, Trinidad Refined, ℔ ton.....$30.00
Asphaltum, Fine Grade, ℔ lb.....08
Coal Tar Felt, 1 Ply, ℔ lb.....02
Coal Tar Felt, 2 Ply, ℔ roll 108 sq ft.....1.42½
Coal Tar Felt, 3 Ply, ℔ roll 108 sq ft.....1.85
Roofing Pitch, ℔ gal.....09

Chains.

Revised List.

Trace, 6¼-10-2.....℔ pair 1.03
Trace, 6¼-10-3.....℔ pair .92 .....50&10
Trace, 7-10-2.....℔ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....℔ lb 5¾@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 75

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt	$4 00	$4 50	$.....
Dairy, 14 qt	4 50	5 00	.....
Fire 12 qt	5 00	.....	.....
Sugar	6 00	6 50	.....
Horse	.....	5 00	.....
Buggy	4 00	.....	.....
Chamber, Slop, Commode 5 and 5X 14 qt.	6 50	7 50	8 50
Jars, slop, 5 and 5X 14 qt	8 00	9 00	10 00

	Nos. 1	5.	5X.
Basins, wash—			
10¾ inch	2 00	2 25	.....
12 inch	2 25	2 75	3 25
13¾ inch	2 75	3 25	3 75
15 inch	3 25	3 75	4 25
Bowls, fruit	.....	2 50	.....
Servers, 12 in	.....	2 25	.....
Baskets, waste paper, 13 in	.....	6 00	.....
Spittons, "Daisy," pressed			
8 inch	4 00	4 50	5 00
10 and 11¾ inch	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....℔ gross $12, dis 25@25&5

Hanger

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 60
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 50&10
Richard's.....dis 30@30&10

Horse Nails.

No.	10	9	8	7	6	
Ausable, ℔ D.	23	24	25	26	28	dis 40
Putnam, ℔ D.	18	19	20	21	23	dis 15
Essex						dis 25&10

Horse Shoes.

Burden, at factory.....℔ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....℔ keg $4 00
Mule Shoes, at factory.....℔ keg $5 00

Knobs.

Carriage, japanned.....℔ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hematite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbin, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 70&10
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....℔ gross $4.80

Plumbs and Leve s.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

Pokes, Animal.

Bishop's I. X. L.....℔ doz $6 00
Bishop's O K.....℔ doz $5 25
Bishop's Pioneer.....℔ doz $3 75
Bishop's American.....℔ doz $2 75

Rakes.

Cast steel.....dis 70
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@$4....dis 10
Rifle razor.....dis $9 50 net

Rat Killers.

Schuyler's.....℔ gross $15 00

Scales.

Hatch, Counter, No. 171.....℔ doz $21 00
Hatch, Tea, No. 161.....℔ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....℔ doz $18 dis 25

Squares.

Steel and iron, Nickel plated.....dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, Oct. 19, 1890.

American iron carpet tacks all kinds dis 70&10&10
Steel carpet tacks all kinds.....dis 70&10&10
Swedes iron carpet tacks, all kinds dis 70&10&10
Swedes iron tacks.....dis 70&10&10
Swedes iron Upholsterers' tacks..dis 70&10&10
Tinned Swedes iron tacks.....dis 70&10@10
Tinned Swedes iron Upholsterers' tacks.....dis 70&10&10
American iron cut tacks.....dis 67½&10&10
Copper tacks.....dis 50
Copper finishing and trunk nails.....dis 50&00
Cigar box nails.....dis 45&10
Finishing nails.....dis 6
Hungarian nails and miners' tacks.dis 62½&5
Gimp and lace tacks.....dis 70&5
" " " tinned.....dis 66&10
Trunk and clout nails.....dis 66⅔
Tinned trunk&clout nails.....dis 66&10&10
Basket nails.....dis 66&10&10
Chair nails.....dis 66&10&10
Common and patent brads.....dis 66&10&10

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Superior Quality.

PACKING, BELTING, HOSE, GASKETS, TUBING, Etc.

Fuller Brothers,

42 Public Sq., CLEVELAND, O.

MAIL ORDERS GIVEN PROMPT ATTENTION.

MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 9½

Bellows.

Blacksmiths' { Hill's.....dis 40
Bullock's.....dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard.dis 60&10
Shults Raw Hide Leather Belting, single, ...dis 40
Shults Raw Hide Leather Belting, double, and Light Double.....dis 40
Standard, oak tanned.....dis 50@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9½@10½

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¼".....dis 50&10
Morse Taper and Straight shank Larger than 1¼".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4¼c	5¼c		2¾c
¼ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6¾c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@5[illegible]&5

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. P.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
ndustry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5¾	4½	4	3½	2⅝
Hexagon	15¾	11¼	8¾	6	5¼	5¼	5
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ¼c., lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 { Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 70@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ¼ inch and over.....₩ lb 13¼
Sisal, ¼ inch and over .....₩ lb 13¼

Sand Paper.

B. A. & Co.....dis45@50
H. H. Barton's.....dis40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll .....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls		21c@29c
No. 18 " " ¼ and ½ "		18c@28c
No. 36 " " ¼ and ½ "		16c@27c
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)		11½c
3-Ply " 1 lb Balls		12@12½c
3-Ply " 1½ lb Balls		11@11½c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 30
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30

Wire.

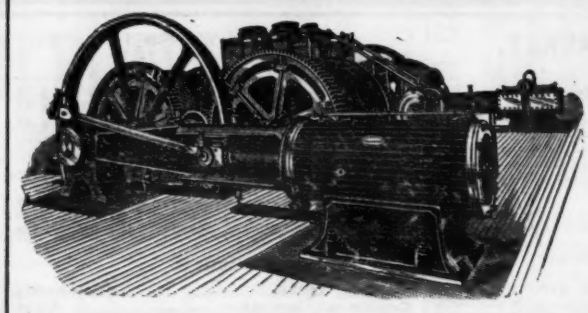
New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 3

Wrenches.

Coe's genuine, ...dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10.& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40

Webster, Camp & Lane Machine Co.



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Mining Machinery,

Improved Band Friction Hoisting Machinery, Geared or Direct Acting, for round or flat rope.

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Endless or Tail Rope Systems.)

CORNISH PLUNGER AND BUCKET LIFT PUMPS.

Automatic or Slide Valve Steam Engines, Sheaves, Cages, Buckets, Etc.

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THE GUM ELASTIC ROOFING

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CLEVELAND, O.
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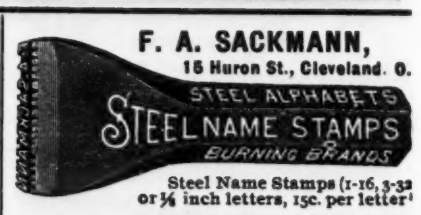

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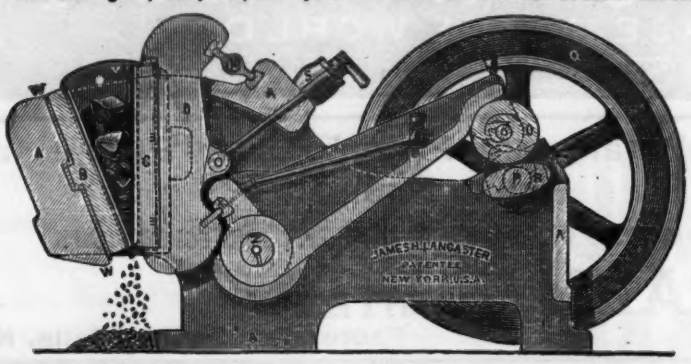

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Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	†1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

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(Standard Gauge.)

Depart for—
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Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.
Arrive from—
Zanesville and Coshocton—10:30 a. m., 6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.
Trains marked * run daily.

From Cleveland Union Station.

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Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	7 45 a m	d5 25 a m
	1 15 p m	12 50 p m
	d11 10 p m	6 35 p m
Wheeling and Bellaire.	7 45 a m	12 50 p m
	1 15 p m	6 35 p m
	*11 10 p m	.....
Alliance Accom.....	3 25 p m	10 10 a m
Ravenna Accom.....	5 00 p m	8 25 a m

d Daily. * Except Saturday. Other trains except Sunday.

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FOR AKRON, CANTON AND MARIETTA.
Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 25 a m	*6 30 p m
Marietta Express.....	*11 15 a m	*2 45 p m
Balto. & Wash. Express....	*4 30 p m	*10 25 a m
Cleve. and Canton Express	†6 30 p m	†8 15 a m

*Daily. †Daily, except Sunday.
J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

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Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest.	8 00 a m	d 7 00 am
	d 8 00 p m	5 40 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	1 15 p m	12 50 p m
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No. 70, Pittsburgh Accom.....	*11 25 a m
No. 64, New York & Pitts. Limited...	* 2 50 p m
No. 66, Mantua Accommo.....	* 4 20 p m
No. 74, Youngst'n Ex.....	† 6 00 p m
No. 68, New York & Pitts. Ex.....	*11 00 p m
	Arrive.
No. 61, N. Y. & Pittsburgh Express...	† 5 15 a m
No. 71, Youngstown Accom.....	* 7 15 a m
No. 65, New York & Pitts. Lim.....	* 9 55 a m
No. 67, Pittsburgh Accom.....	*12 45 p m
No. 73, Leavitsburgh Local.....	* 2 10 p m
No. 63, New York & Pitts. Ex.....	* 6 50 p m
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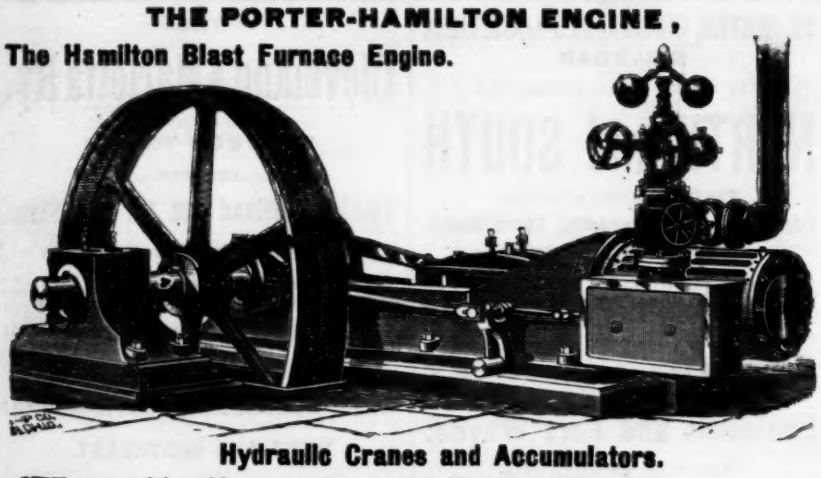
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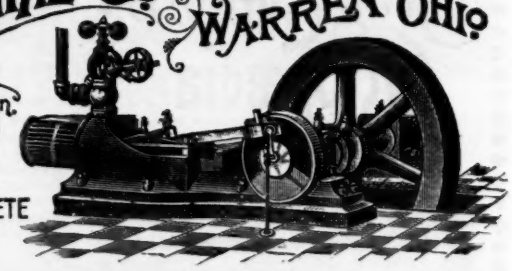

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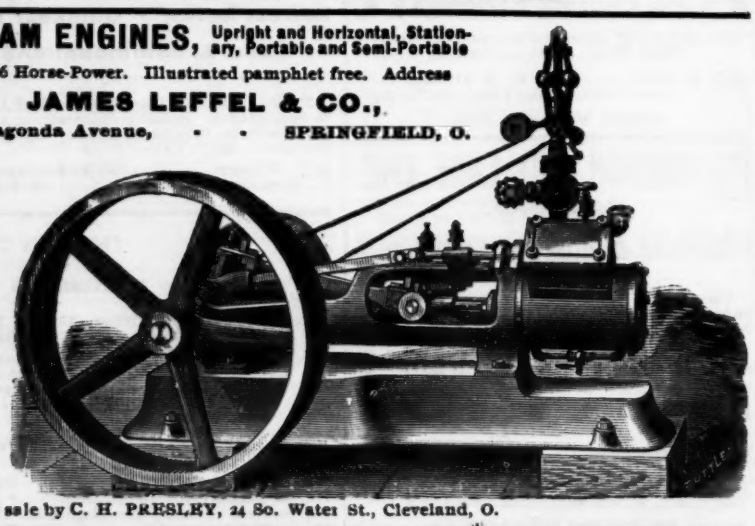
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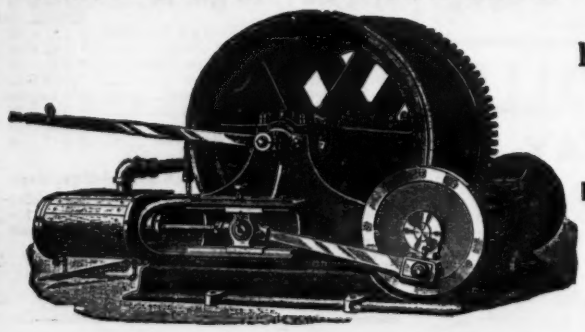
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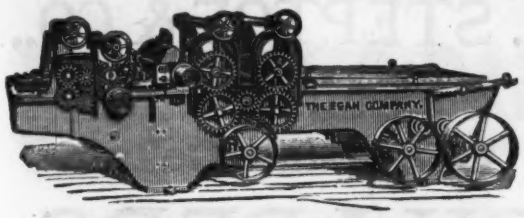

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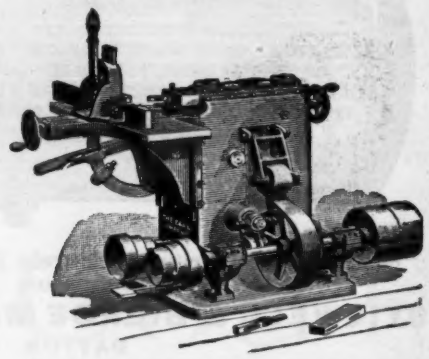

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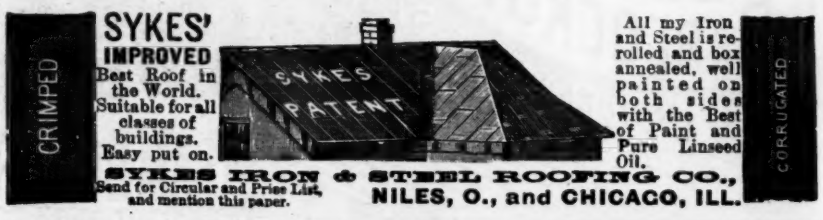
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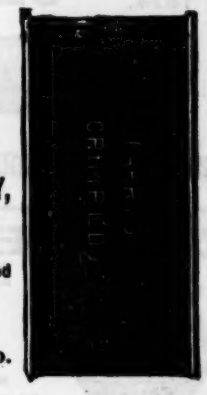

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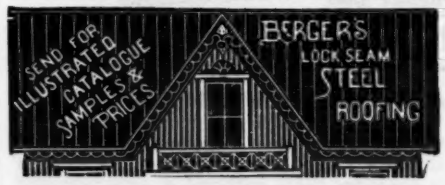

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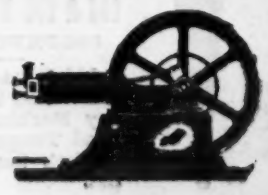

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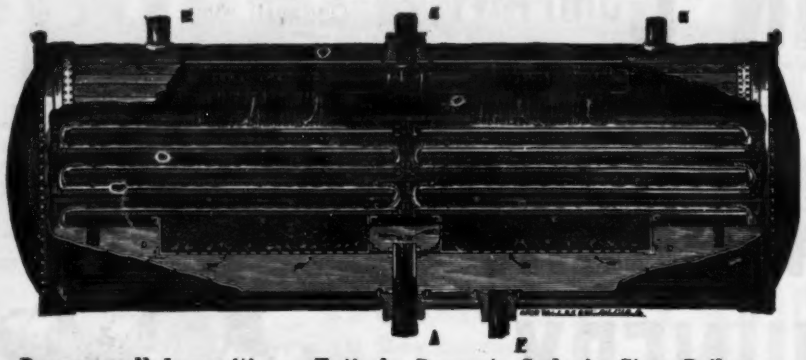

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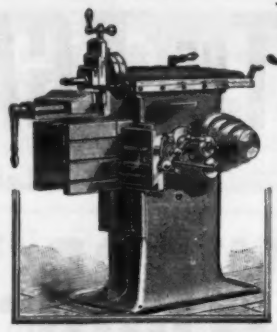

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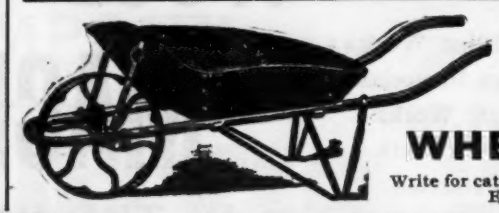

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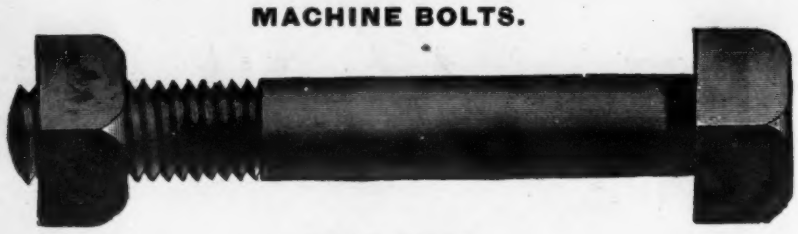
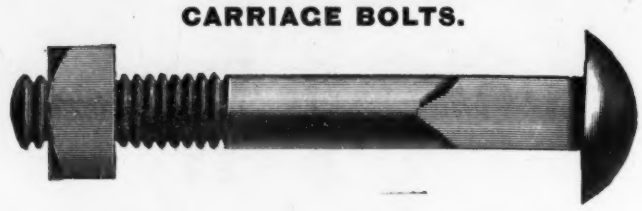
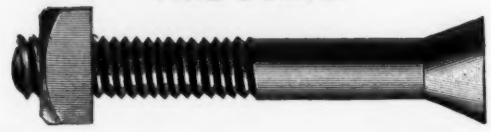


CARRIAGE BOLTS.



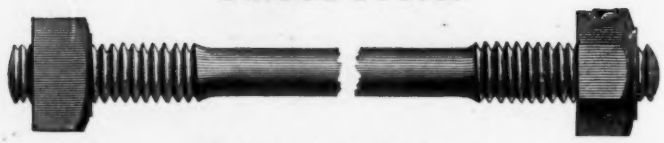
BOLT ENDS.

TIRE BOLTS.

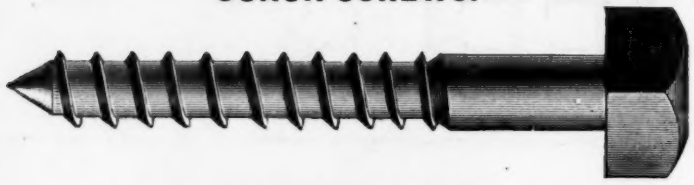


END SPRING BOLTS.

BRIDGE BOLTS.



COACH SCREWS.

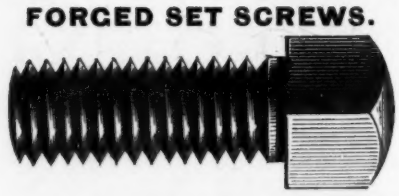


CENTER SPRING BOLTS.

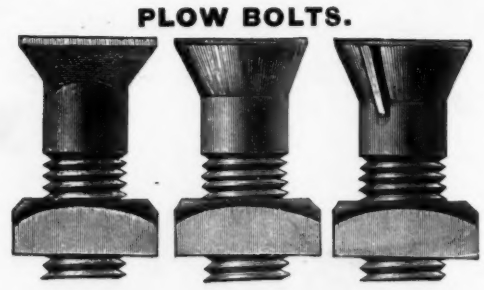
HANGER SCREWS.

AXLE CLIPS.

FORCED SET SCREWS.

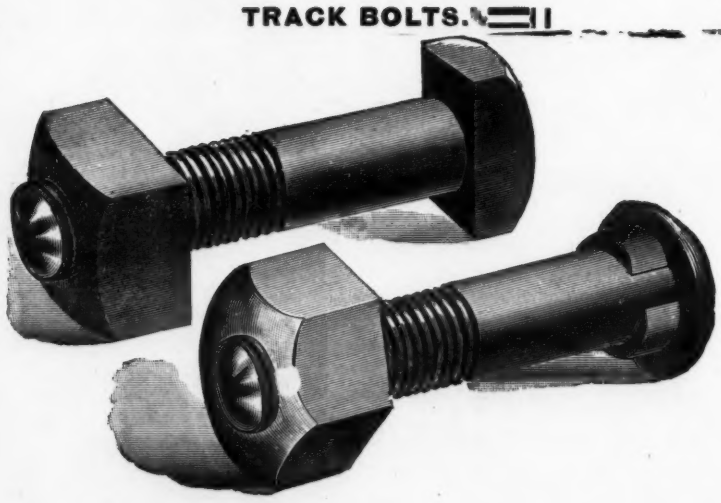


PLOW BOLTS.

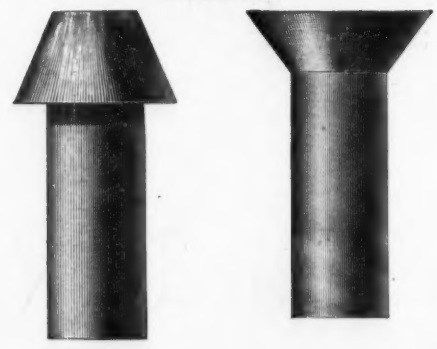


ELEVATOR BOLTS.

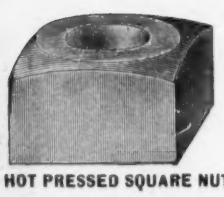
TRACK BOLTS.



RIVETS.



SHAFT BOLTS.



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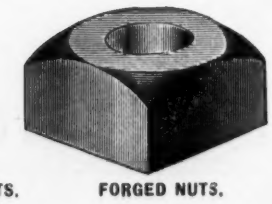

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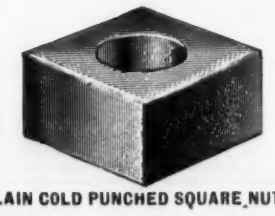

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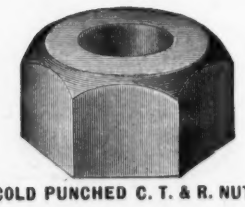

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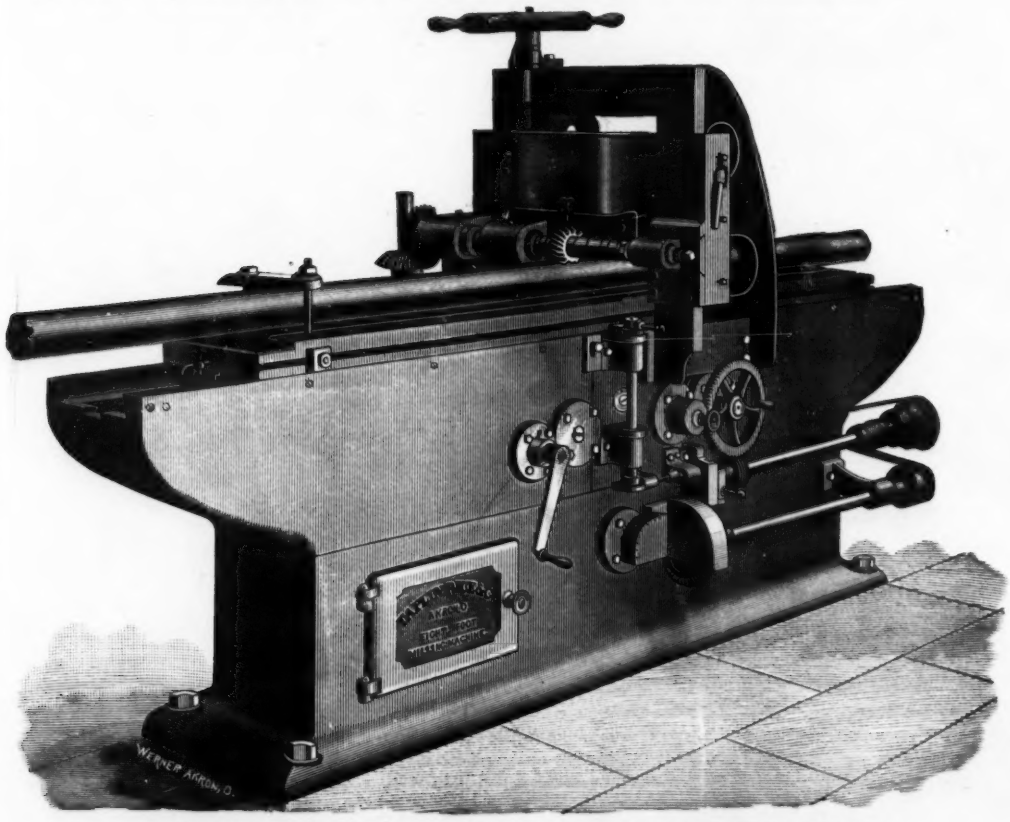

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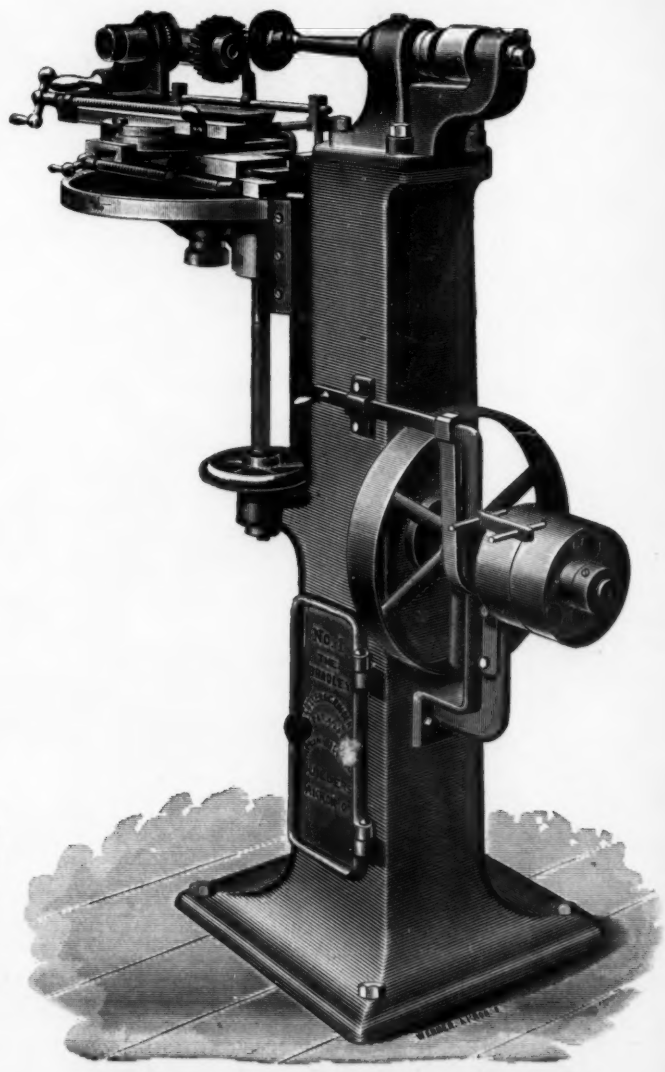

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